RAILROAD GAZETTE

FRIDAY, AUGUST 3, 1900.

CONTENTS

Contributions

The First Steel Cab.

Ferrocarril Central Mexicano,
Mexico, July 25, 1900.

TO THE EDITOR OF THE RAILROAD GAZETTE.

I noticed in the July 13 issue of your paper an article headed "The First Metal Cab." In this Mr. Francis R. F. Brown suggests that probably some steel cabs built by him before 1889 were the first steel cabs used in America. In the spring of 1881 the Mexican Central Railway received some locomotives from the Baldwin Locomotive Works with steel cabs, and we have built only steel cabs since 1881.

F. W. JOHNSTONE,
Superintendent M. P. & M.

Corrosion of Steel Cars.

Pressed Steel Car Company.
Pittsburgh, July 30, 1900.

TO THE EDITOR OF THE RAILROAD GAZETTE.

This department having been requested to submit to you certain data regarding the corrosion of steel cars, we would state that we have a very large number of cars that have been in service for three years, and every report concerning them has been very gratifying. So long as the cars meet with ordinary conditions, the corrosion is extremely slight, and would indicate a life of at least 20 years. This is deduced from taking the steel bottoms of locomotive tenders as a basis. You there have ⅛ in. material on which the coal is constantly wetted down, and the life of such tenders is at least 10 years, and sometimes 15 years. Apply this to the fact that we use at least ¼ in. material, and you can see that our estimates are very conservative.

In regard to the special case mentioned by you (in which the corrosion was said to be very great), would state that the matter has been thoroughly investigated not alone by us but by the railroad company, and we have found in conjunction with the railroad company that these cars were lying idle side tracked for seven months in the open weather, enduring all climatic changes, etc., and corrosion did take place in a slight measure. It was so slight, however, that when emptied, the life of the cars was found in no way to have been shortened, and a coat of paint totally obliterated the seeming injury. It was the sense of the company, as well as ourselves, that the exposure the cars had undergone was equal to at least 5 years of actual service, and, after comparing all notes, it was the mutual judgment that the cars in question would last at least a period of 20 years under ordinary conditions. So, you will see that, when digested, the matter of corrosion of steel cars is a very small thing and could not be in any way construed as a deterrent feature in the use of steel cars.

PRESSED STEEL CAR COMPANY.

Permanent Way of the New York Central.

We have received a copy of the inspection diagrams of the track of the New York Central for 1899, as condensed from the records made by Mr. Dudley's apparatus. The diagrams show the three divisions, namely, the Hudson Division, New York to Albany; the Mohawk Division, Albany to Syracuse, and the Western Division, Syracuse to Buffalo, giving particulars of alignment, gage, surface, age of rail and profile. The surface is shown for 1898 as well as for 1899.

Mr. Dudley says that the inspection shows the highest standard of track ever attained, and accompanying his report is a diagram showing comparative undulations in the main line for each year from 1881 to date. On the condensed diagrams the undulations are shown for each mile, and for each track from New York to Buffalo.

The machine records mechanically, and among other things the vertical undulations of the surface of rail are summed up mechanically in feet and inches per mile. The number of feet and inches per mile reduced to inches is divided by 176, the number of 30-ft. rails per mile, and thus we get a figure of undulations per rail. This average for each mile is plotted on the sheet and the points so obtained connected. This, as we understand it, is the method of constructing the condensed diagrams, which diagrams show, therefore, undulations per rail in hundredths of an inch.

It is quite astonishing to see how much smoother the 1899 track is than the 1898 track, even where the rail has not been renewed between the two inspections. Mr. Dudley says "the undulations in the track for 1899 are reduced to as low limits as each section and the condition of the rails admit." The 6-in. 100-lb. rails show a stability of 2 to 1 as compared with the 80-lb. section. The stiffness of the 100-lb. section is 80 per cent. greater than that of the 80-lb. section, but the surface of the 5½-in. 80-lb. rail is unexcelled by rails from 5 to 10 lbs. heavier per yard. Mr. Dudley calls attention to the fact that the gage of track is practically perfect, and he attributes this result in part to the fact that the broad, flat heads of the rail sections do not roll under the wheel. Following are quotations from Mr. Dudley's report to Mr. Wilgus, the Chief Engineer.

"The full value of each section of the rails having been obtained in the track renders the 'Condensed Diagrams' for 1899 the most instructive of the entire series. That it has been, and is possible, with the high grade steel in the rails, and the three-tie joints, for you to hold the condition of the track on rails four to nine years old, practically the same as when new, under the heavy traffic, is a new experience in the construction and maintenance of permanent way and of a decided benefit to a railroad company. . . .

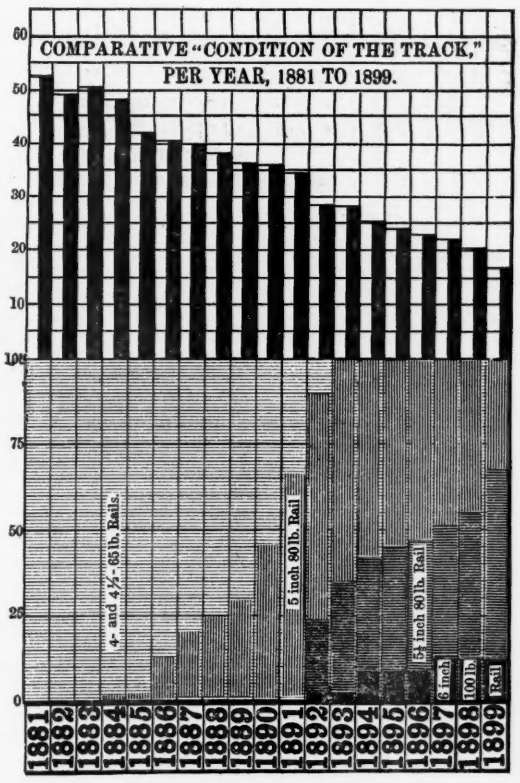


Fig. 53.—Dudley on New York Central Track.

NOTE.—*The solid black lines in the upper part of the diagram show the average vertical undulations of one rail expressed in hundredths of an inch. The shaded parts of the diagram show the percentages of each kind of rail in track in each year.*

"To understand the decided improvements which have been taking place for many years, I have prepared diagram No. 53, which shows the reduction in undulations in the tracks from 1881 to 1899. Nearly a year's labor has been expended in getting together the data for its preparation, and it forms a valuable comparison of what has been accomplished. Only one other similar comparison for a railroad exists. It covers a period of great progress in rail transportation in which the New York Central & Hudson River Railroad Co., by its progressive policy in making practical demonstrations, has been a leader, and has contributed more than to its own advancement. . . .

"For low-grade lines any reduction in undulations in the track rapidly reduces the train resistance and permits heavier or faster trains to be run. It is interesting to see the progress of the improvements as the undulations decreased.

"The first inspection in which the undulations were summed up by the present mechanism of my car was in 1881. At that time the rails weighed 65 lbs. per yd., and were from 4 to 4½ in. high, and as Cut. No. 53 shows, the undulations in the track were above the fifty-second line* on the 'Condensed Diagrams,' and are now less than one-third as high. On the freight tracks the undulations were still higher, and have been reduced to one-fifth of the former amounts. Most of the rails had taken a set in the track, and nearly all of the joints were low, the receiving ends of the rails being cut out. . . .

"In the spring of 1883 I was directed to design a rail which would better meet the conditions of service, as shown by the several diagrams of track inspection. These indicated that the rails were all deficient in stiffness and side stability. Stiffness and side stability were of primary consideration in the design of the 5-in. 80-lb. section. With an increase of 23 per cent. in metal the stiffness of the 80-lb. section was increased 66 per cent. over the 4½-in. 65-lb. rails. . . . The 5-in. 80-lb. rails once in the track demonstrated the great value of the mechanical element of stiffness in a rail section to sustain heavy traffic.

"The great increase in speed and weight of trains since the introduction of the 'Pioneer' 5-in. 80-lb. steel rails by the New York Central & Hudson River Railroad in 1884 marks an epoch in the improvement and stability of permanent way as valuable as the introduction of Bessemer steel for rails. The policy of the New York Central & Hudson River Railroad Co. in introducing heavy stiff rails and taking advantage of their benefits, was at once recognized by other railroad companies, and has been followed by all important lines. The result is, the permanent way of some of the American lines has reached a higher stability and capacity for heavy passenger and freight trains than elsewhere in the world. . . .

"The ability to draw 80 loaded 60,000-lb. capacity cars in one train, by one locomotive, shows what has been accomplished in the way of reducing train resistance by improving the track, motive power and rolling stock. On the light 4½-in. 65-lb. rails the freight train resistance was 7 to 8 lbs. per ton, and is now reduced to 3½ lbs. on the 5½-in. 80-lb. rails for the 60,000-lb. capacity cars and long trains. For 80,000 or 100,000-lb. capacity cars loaded it would be still less. . . . It must be expected that these heavy and fast trains, requiring increased tractive power, will render your traffic conditions about the same as though you were operating on heavy gradients. But you are moving greater paying loads, your train expenses are reduced, and, as the 'Condensed Diagrams' show, the condition of the track improves from year to year.

"It has been asserted within a short time, by writers on train resistance, that it would be impossible to run such large and heavy passenger and freight trains as are regularly installed in the service of the New York Central & Hudson River Railroad. They based their calculations, however, upon train resistance derived from experiments on poor track, and were unable to see or understand that good track of stiff rails was such an important factor in reducing train resistance. . . ."

*See above for the explanation of the meaning of these "undulations."—Editor.

Block Signals on the Chesapeake & Ohio.*

The controlled manual block system, in which the signals are operated manually and so constructed as to require the co-operation of the signalman at both ends of the block to display a clear signal, is, I think, the most desirable on a single track road, as it is necessary to protect both ahead and in rear. This is the method in use on the road with which I am connected. We use what is known as the Leonard Electric Block machine, of which we have about 150 machines in use.

The two ends of the block, varying in length from 3 to 5 miles, are connected by an overhead single grounded wire. The machine is wired with two circuits, one through a magneto bell to earth, which is normal position—the other controls a locking arrangement which prevents the semaphore signal being moved without the co-operation of signalmen at both ends of block. The movement is made by signalman desiring to pass train through block, which station call A, signaling to other end of block (B) by magneto to unlock A's semaphore lever. If track is clear, B turns switch throwing current from his battery on to wire which energizes relay at A, releasing lock of semaphore lever. This movement of switch at B locks his switch, so he cannot make another movement until the train passes through the block and over a track box at B, releasing the switch. The switch when locked breaks circuit, so that A could not unlock B's semaphore even if he were asked to do so, while train is moving from A to B. While semaphore signal is set in clear position a tell tale bell continues to ring until signal is set back to danger, calling signalman's attention to position of signal. The magneto signals can be made at all times, and are used to report train entering block, clear of block, etc., instead of using telegraph line for such reports.

On our road the machines are operated by the telegraph operators, although the signalman does not necessarily have to be a telegrapher. Being coupled to regular signal levers they require no extra work.

They are economical as to first cost and in maintenance. The batteries are in use for such short periods that they last from 18 to 20 months. A telegraph lineman looks after telegraph and signal wires on about 90 miles of road and 25 to 30 machines. The parts being very simple, there is seldom any failure. If one occurs it is generally found in the battery from a broken jar or rusted connection. Our officials feel that the system is

*Abstract of a paper read before the Association of Railway Telegraph Superintendents by Mr. H. T. Simpson, Superintendent of Telegraph of the Chesapeake & Ohio.

a great safeguard in moving trains. There has never been an accident that could be charged to the machines since their installation some four or five years ago, and they have undoubtedly prevented accidents that would have occurred without them.

We have three or four blocks equipped with the staff system. This is a very safe method, though its first cost is considerable. This is also a manual controlled system, requiring co-operation of signalmen at both ends of block. The stations are connected by an over-head wire. Each machine has a number of staffs locked in. To pass a train through a block, signalman at A asks B to unlock machine so he can get staff (which is a key). After one staff has been taken out, another staff cannot be gotten out of machine at either station, owing to direction of current being changed in removing staff. After taking staff out of machine and using it to unlock lever to clear signals it is given to train to carry to other end of block and deliver to signalman; who puts it in machine, changing direction of current again and making the two machines work in harmony, allowing another movement to be made.

Automatic signals seem to be generally used on double track roads. Trains wait at a block signal if it shows danger, from 2 to 5 minutes, and then proceed, and by some persons it is believed unnecessary for trains to wait any time, but proceed at once after observing that the signal shows danger. This system I do not think recommends itself for single track blocking, which should be absolute.

I have not had much experience with bonded track circuits, but what I have had leads me to believe they are expensive to maintain in satisfactory condition, consequently my preference is for over-head wire connection.

New Class "D" Passenger Locomotives of the Chicago & Northwestern.

Two of the new class "D" passenger locomotives, referred to in our issue of June 15, and built by the Schenectady Locomotive Works for the Chicago & Northwestern, are now in service and four more are about completed. These were designed by Mr. Robert Quayle, Superintendent of Motive Power and Machinery, for heavy fast passenger service, and one is now running between Chicago and Clinton, and the other between Boone and Council Bluffs. In the first instance the usual train has nine cars, weighing about 400 tons, and the schedule for the 138 miles is 3 hours and 25 minutes. This includes in all 11 stops, eight of which are at stations. Occasionally these trains have 11 cars.

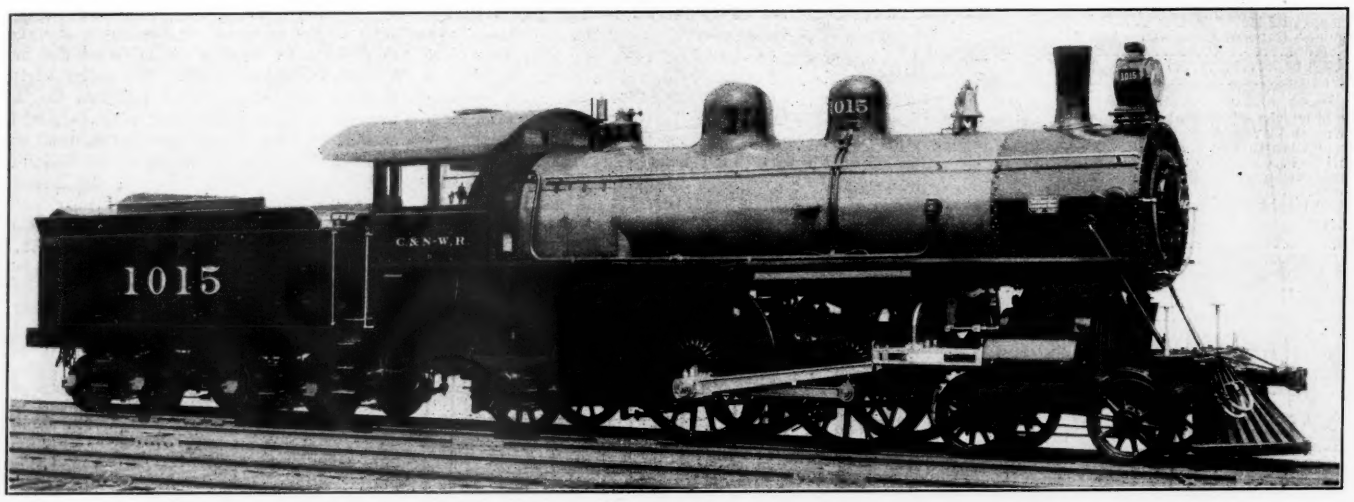
While these engines have only been working a short time, it is apparent that they are far better adapted for fast running than previous designs, being much easier to fire. They ride easier, and the indications are that under similar conditions the coal consumption is about 20 per cent. less than with the standard eight-wheel engines, having smaller boilers and grates. The larger and better shaped grates and large heating surface make these very free-steaming engines. We are told that there is practically no black smoke, even when worked hard, and that the two doors are conducive to light firing. Even when working with long cut-off and a light fire, the draft is not sufficient to turn the fire on the grates, and in consequence heavy trains are brought up to speed in a remarkably short time. Less skilful firemen with the new engines easily excel the work of the best men with the older engines. It is also apparent that these engines have a further advantage in that if need be inferior grades of bituminous coal can be burned, and several times in recent years roads running into Chicago have been seriously affected in this way by strikes at the coal mines which are depended on for fuel. In referring to these engines before, we said that in the adaptation of a more rational grate area and better shaped grate for bituminous coal, these passenger engines take rank with Mr. Delano's "Prairie" type freight engines. Both have fairly wide grates and the cab at the rear, and in both the novel features in the design of the details are mainly due to changes in the grate proportions. In the Northwestern engines there are two pairs of driving wheels, a four-wheel leading truck and a pair of trailing wheels, and this design will be called the "Northwestern" type.

The cylinders, which are bushed, are 20 x 26 in., spaced 86 in. center to center, and the working steam pressure is 200 lbs. The piston rods are 3¼ in. in diameter, and fitted with metallic packing. The weight on driving wheels is 91,000 lbs., on the front truck 33,000 lbs., and and on the trailing wheels 34,000 lbs., making the total weight in working order 158,000 lbs. The driving wheels are 80 in. in diameter, the truck wheels 36 in., and the trailing wheels 48 in. The driving journals are 9 in. in diameter by 12 in. long, the truck journals are 6 x 10 in., and the trailing axles have outside journals 7½ x 12 in.; all journals, including those of the tender, being fitted with water pipes for use in emergency cases. The crank pin journals are correspondingly large, being 6 in. in diameter by 6 in. long for the connecting rod journals, 6¾ x 4½ in. for the main side rod journals, and 4½ x 4 in. for the side rod crank pin journals. The driving wheel base is 7 ft., the rigid wheel base 16 ft., the total wheel base of the engine is 26 ft. 9 in., and of the engine and tender 54 ft. 8¾ in. The four-wheel leading truck has a swing bolster.

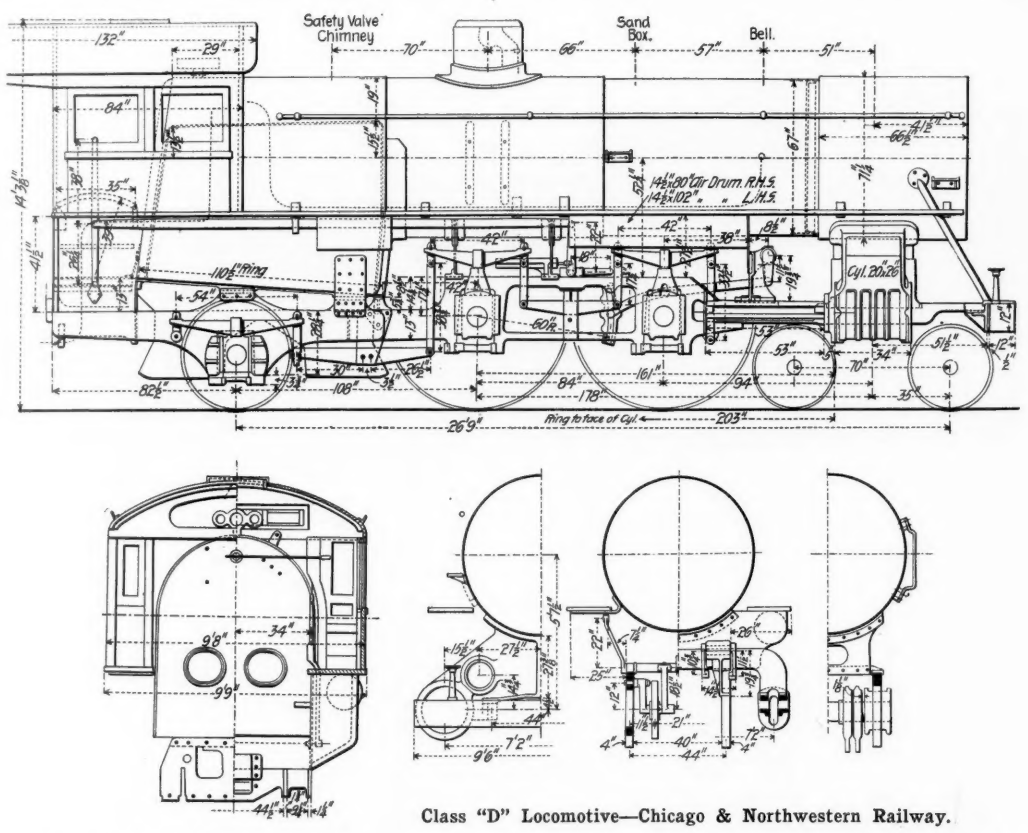
It will be seen from the accompanying drawings that the boiler is of the straight barrel radial stay pipe, 68⅜ in. in diameter, outside, at the front with the center line 109½ in. above the rail, and that the outer fire-box sheets are vertical and outside the lines of the main frames. All the boiler and fire-box sheets are Carbon steel, and those of the barrel and outside of the fire-box are 11-16, ½ and 7-16 in., the horizontal seams of the barrel having sextuple riveted butt joints with inside and outside welt strips. The circumferential seams are double riveted. The frames drop down behind the second pair of drivers, so that the usual depth of fire-box for bituminous coal is maintained, being 76¼ in. at the front end and 67 in. at the rear. The back head of the boiler is made sloping to reduce the weight on the rear wheels, a difference of about 2,000 lbs. being made in this way. There are two fire doors. The sides, back and crown sheets of the fire-box are all ⅜ in. thick, and the tube sheet is ½ in. The water spaces are large, being from 4 to 5 in. at the sides, 3½ to 5½ in. at the back, and from 3½ to 4½ in. in front. All stay bolts are Taylor iron, and drilled with tell-tale holes. The grate slopes slightly forward, and is 102⅛ in. long by 65¼ in. wide, giving an area of 46.27 sq. ft. There are 338 tubes, 2 in. in diameter and 16 ft. long, and the fire-box has a brick arch on water tubes. The tube heating surface is 2,816.91 sq. ft., that of the fire-box is 170.7 sq. ft., and of the water tubes 28.27 sq. ft., making a total heating surface of 3,015.88 sq. ft. It will thus be seen that the heating surface and grate area are unusually large for an engine of this type. Rocking grates are used, being the road's standard, and the engines are now running with a single exhaust nozzle 5⅛ in. in diameter, but it is proposed to increase the opening to 5¼ in. The stack is tapered from 14 in., inside diameter at the base to 16½ in. at the top, which point is 15 ft. 1⅝ in. above the rails.

In consequence of the boiler construction, a rearrangement of the frames at the rear becomes necessary. As shown by the drawings, the frames are made 14¼ in. lower back of the second drivers, and are reduced in width from 4 to 1¾ in., the main frames being continued to the rear, clearing the trailing axle. An auxiliary plate frame, 1¼ in. wide, extends the length of the fire-box on either side, and is placed directly beneath the mud ring and 9½ in. from the main frame, to which it is connected at the front and back by bolts and filler blocks. The trailing wheels extend up between these frames, and the outside journal boxes work in cast steel pedestals bolted to the auxiliary frames. These also support the expansion pads, and receive the weight of the boiler at the rear. With the outside bearings, the boxes are removed from the heat and dirt of the ash pan, and can be easily inspected, but a further advantage seems to be that the rolling of the engine is greatly reduced. A semi-elliptic spring is used directly above the rear journal box, and that axle is equalized with the driving axles by means of a cross-equalizer, the rear longitudinal equalizers resting on the cross-equalizer as shown by the drawings.

Piston valves, 11 in. in diameter, are used, having internal admission, as given in the detail drawing. Hav-



Class "D" Passenger Locomotive of the Chicago & Northwestern—"Northwestern Type."



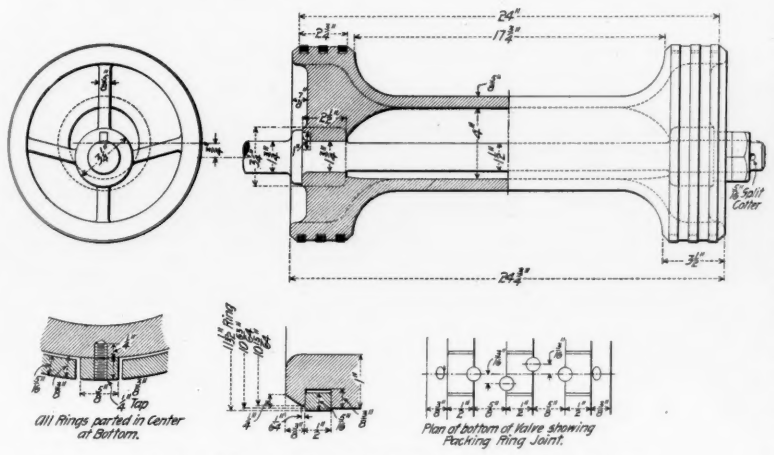
Class "D" Locomotive—Chicago & Northwestern Railway.

ing the exhaust steam chambers at the ends makes it easy to maintain the valve rod packing, and permits of the use of hemp for packing the valve rods. The body of the valve is cast iron, and three cast iron packing rings are used at either end. In this way two rings are effective in any position of the valve. The valve is kept from turning by having the valve rod set ¾ in. off center, and all the rings are parted at the bottom of the valve chamber, where there is a bridge 2 in. wide. Small pieces of the same section as the rings are fastened to the valve at the bottom, and form stops which hold the rings against turning. The greatest travel of the valves is 6 in., the outside lap is 1¼ in., the inside lap, front and back, ⅛ in., and the valves are set line and line in full gear.

As shown, the valve chamber is located almost in line with the frames, and is cast in the saddle close to the cylinder, making short passages. This location is possible on account of the arrangement of the valve gear. A bar from the link block extends above the front driving axle, and drives one arm of a rocker, the other arm of which hangs downward, and is attached to the valve rod. This extension bar with the rocker and link hanger form a parallel motion which transmits directly the movements of the link block to the valve rod. Such a modification is required by the use of the internal admission valve. The saddle casting made in this way has a better appearance, and is probably stronger than the usual form. As stated, the cab is at the rear, so that both engineman and fireman are together, and it will be seen than the running board extends to the front end of the smoke-box. Beneath the running board on either side are two main reservoirs, which are unusually long.

Cast steel is largely used for such parts as wheel centers, cross-heads, pistons, driving boxes and the pedestals of the trailing wheels, the cross bar at the rear of the frames and the extension bars and rockers of the valve gear, in addition to numerous smaller parts which are cast steel.

The tenders of these engines have two four-wheel center-bearing trucks with side bearings on both. The weight empty is 43,200 lbs., and the capacity for water is 5,200 gallons, and for coal, 8 tons. The underframe consists of 10-in. steel channels, and the wheel base is 16 ft. 10 in. The trucks are of the diamond frame type with 36-in. steel tired wheels, and the journals are 5 x 9 in.



11-in. Piston Valve—Class "D" Engine, C. & N. W. Ry.

Dimensions of Fast Passenger Locomotives.

Published in *The Railroad Gazette.*	Aug. 3, 1900.	May 26, 1899.	July 7, 1899.	Nov. 10, 1899.	May 19, 1899.
	Type—"Northwestern." Road—C. & N. W. Kind of Coal—Bituminous.	Type—8-Wheel. Road—C. & N. W. Kind of Coal—Bituminous.	Type—Atlantic Road—Penn. R.R. Kind of Coal—Anthracite.	Type—10-Wheel. Road—L. S. & M. S. Kind of Coal—Bituminous.	Type—Atlantic. Road—Lancashire & Yorkshire. Kind of Coal—Bituminous.
Weight on drivers, lbs.	91,000	87,000	101,550	133,000	78,400
Weight total, lbs.	158,000	137,000	173,450	171,600	131,600
Cylinders, size, in. x in.	20x26	19½x26	20½x26	20x28	19x26
Drivers, diam.	80	75	80	80	87
Boiler pressure, lbs.	200	190	185	210	175
Heating surface, tubes, sq. ft.	2,817	2,313	2,102	2,694	1,877
Heating surface, fire-box, sq. ft.	199	195	218	223	176
Heating surface, total, sq. ft.	3,016	2,508	2,320	2,917	2,053
Fire-box, length in.	102⅛	108 3-16	104	121	89⅝
Fire-box, width, in.	65¼	40⅝	96	41	42
Fire-box, depth, front, in.	76¼	79¾	—	78	83½
Fire-box, depth, back, in.	67	66¼	—	63½	83½
Grate area, sq. ft.	46.3	30	69.2	33.6	26
Tractive power at starting, lbs.	22,100	21,275	21,480	24,990	16,080
Cylinder volume, cu. ft.	9.5	9	10	10.2	8.5
Heating surface ÷ grate surface	65.2	83.6	33.5	86.8	79
Heating surface ÷ cylinder volume	318.8	278.7	232	286	241.5
Grate surface ÷ cylinder volume	4.9	3.3	6.9	3.3	?
Fire-box heating surface ÷ total heating surface	.06	.07	.09	.07	.08

The special equipment includes American-Westinghouse brakes on the backs of the drivers and trailers, Westinghouse tender brakes and 9½-in. air pump and air signal, National steel tired wheels, two No. 10 Monitor injectors, Jerome metallic packing for piston rods, the Vogt throttle, magnesia sectional lagging on the boiler and cylinders, the Leach sander, the Gollmar bell ringer and three 3-in. Ashton safety valves.

That comparisons may be made readily between this and other notable engines, the accompanying table is given. While it could be extended almost indefinitely the engines shown will be recognized as representing the latest development of the several types. Attention is called to the relation between heating surface and cylinder volume, the table showing that the new Northwestern engines have an unusual amount of heating surface per unit of cylinder volume. It will also be seen that the grate surface is intermediate between present practice for soft coal burning engines and grates designed to use anthracite coal.

Motive Power and Train Movement Statistics.

The motive power man wants to know the efficiency of certain types of locomotive design, to produce out of coal and wages the maximum power. For the time, he is not discussing the weight of his engine. Therefore he considers the resistance of the engine itself as part of the train resistance which his engine is designed to overcome. If all engines were of the same weight, he could ignore the resistance of his engines since it would be an invariable and inevitable quantity under all circumstances as much as atmospheric pressure.

Next, the motive power man wants to discuss the weight of his engines relatively to their cylinder power, as adapted to the topography where the engine works. Now he wants the engine's weight and resistance separately from all the rest of the train resistance.

The motive power man has turned over to the transportation department so much power (on some roads stated at so many tractive units) which is theoretically good to get so much tonnage over the road in a given time. He wants to know how much of this theoretical work he is really able to do. Theoretical work is the starting point, not because it is something that can actually be done, but because it furnishes an unchanging standard against which he may measure what he does. To the extent that the Superintendent keeps his engines in motion and loads them to their ratings, he is approaching his standard of theoretical work. To know how well he uses up what the motive power man gives him, he wants to know the gross train resistances which he has overcome in a certain time. The caboose which he has attached to his train will be included, but not the engine resistance, because that, for his purposes, is a constant quantity. But his primary business is to get tonnage over the road. The unit of what he does is the ton-mile (in general practice.) The unit of what he spends is the engine mile (more exactly stated, the tractive unit mile). It is between the engine mile and the ton-mile where most of his work is done. But it is too often overlooked, that the extent to which he gets miles out of his engine is quite as important as the ton miles which he gets out of his engine mile.

Ton miles per engine mile is the summary figure. It includes the effects of car distribution as shown by the per cent. of loaded movement, and the effects of car loading as shown by the tons per car. If we use this average, ton miles per engine mile, the tons per car and the per cent. of loaded movement must be at hand in memorandum. The usual form of statement is most fallacious. The train is not a unit for more than 20 per cent. of the costs of train movement. The remaining 80 per cent. may have no relation to the train mile. The conductor and flagman and one brakeman with the costs of the caboose are the only fixed costs of the train, while the engineer and fireman, engine hire, repairs and supplies, depend on the number of engines used and oil and waste for cars. car hire and maintenance and extra brakemen are related to the amount of power applied. If we always had one engine to a train and no helpers, the train mile could be used as a *substitute* for the engine mile. But this would be because it *happened* to be always the same as the unit of expense of train-movement expense not because it *was* the unit of expense.

Ton miles per engine mile is, as noted, a summary figure, including several distinct links of a chain of things that are done. If we show our engine costs against the ton mile as wages, coal and supplies per ton mile we shall be mixing up with the efficiency of our wages and supplies, the varying efficiency of the car distributor, the shifting traffic conditions under which he works, and the varying standards of car loading enforced at stations. Over long periods, or for extended outlooks, it may be safe to assume that the variations of these factors are mutually compensated. But this is not a figure by which to watch individual engineers, nor divisions nor railroads from month to month. The engineer consumes his coal to overcome train resistance, regardless of what may be the "consist" of the train behind him.

The General Manager who has authorized the heavier locomotives will from time to time be interested to know the engine costs per ton mile, to compare the performance of his heavier power against that of his lighter power. But this is a special figure, to check up the saving by the use of the new power. It is not a current month-to-month figure by which to determine the efficiency of coals or the economy in use of supplies, or the cost of wages, or the loading and distribution of cars, or the way trainmasters are working their engines. It can not be used for these purposes because our new engine mile is a different thing from the engine mile of the lighter engine. These costs that are related to the engine mile have a different normal ratio to the ton mile. We must not measure two pieces of cloth with yardsticks of different lengths. It is practicable to know the relative length of our "yard" sticks, and in the case of our new engines to know the new normal ratio of our engine costs to our ton mile and adjust our comparisons by this coefficient. But as shown above, the ratio of engine costs to ton miles depends on a large number of factors and our statistics should be designed to bring into outline only one thing at a time. Therefore, it is far better to place our engine costs against the engine mile, making adjustments as determined by practice, to cover the normal increase in costs due to the heavier engine.

Train movement amounts to 25 per cent. of operating expenses or 15 per cent. to 20 per cent. of gross earnings. It is the largest single item of expense that is within control. Hence financiers and investors have come to consider the tons per train mile as the index to the operation of the property. In application of the same principle more accurately, they would make the engine mile and not the train mile their unit of expense and watch the tons per engine mile. But this figure also is inaccurate because it includes revenue tons only. So long as the relative amount of company freight is the same, the figure is close enough. But it is not the same as between different roads nor between different periods on the same road. So far as this variable enters we are obscuring the real thing we seek, viz., the index to what our operating department is doing in its largest single line of expense.

Summing up the conclusions of the foregoing reasoning, and assuming for the time that the ton mile is the unit at work, we would say that to intelligently watch motive power and train movement the following data are necessary:

1. Gross ton miles, including the engine.
2. Gross ton miles, excluding the engine but including the caboose.
3. Gross ton miles of empty cars and of loaded cars separately by direction.
4. Net ton miles by directions and including *all* freight hauled.
5. Engine miles (tractive unit miles, if practicable).
6. Expense of wages and engine supplies.

J. SHIRLEY EATON.

Pressed Steel Cars at Paris.

The Pressed Steel Car Co. has prepared a brief for the convenience of the International Jury of Awards at the Paris Exhibition, from which we take a few points of interest. It is said that the largest exhibit in the United States Section, Class 33, is that of the Pressed Steel Car Co., and that from an economical standpoint this is possibly the most important exhibit at the fair.

There were in use June 1, 1900, in the United States 18,038 steel cars of a capacity of from 100,000 to 110,000 lbs. In 10 years the average capacity of locomotives has greatly increased as the average capacity of the cars has increased, and consequently the cost of transportation has fallen rapidly. Three years ago there were no steel cars running in the United States, except, perhaps, a score or less of experimental cars. By Sept. 1 of this year there will be 24,138 steel cars in service in this country with an average capacity of about 95,000 lbs.

The underlying principle of construction of the Schoen car is to so dispose of the material as to proportion each part to the strain that it has to endure, which is claimed cannot be done by the use of commercial rolled shapes. So a saving of something like 5,000 lbs. per car is realized as compared with a car built of structural steel. This means that the locomotive will haul, say, one or two more loaded cars in a train of six empty cars if they are of the pressed steel design.

The advantages from the use of pressed steel cars, which are independent of the traffic conditions, are reduced number of parts, decreased cost of maintenance and greater life of car; but the traffic advantages are of far greater importance than these. These latter include increased proportion of paying load per train, less number of cars required, saving interest and saving empty car service, shorter trains for a given tonnage, less switching service, less inspection, less wages for trainmen and greater utilization of main line, sidings, terminals, yards and shops.

The following estimate of cost of service of wooden and steel cars in traffic is taken verbatim from the brief:

The introduction of pressed-steel cars in the United States is effecting almost an industrial revolution, the importance of which other nations should not be slow to realize.

The total number of wooden cars in service on the differ-

ent railroads of the United States is about 1,500,000. Taking the average weight of a freight car at about 14 tons, the total weight of all wooden cars in the United States is 21,000,000 tons.

Average capacity of wooden cars		25 tons
Total capacity of all wooden cars in U. S.		37,500,000 tons
Average mileage per year per wooden car, loaded		3,500 miles
Average mileage per year per wooden car, empty		3,500 miles
Assumed average cost of carrying one ton, per mile		.3 mills
Assumed average gross earnings from one ton per mile		.8 mills
Yearly income from total ladings of all wooden cars on above basis		$1,050,000,000
Yearly cost of hauling all ladings	$394,000,000	
Yearly cost of hauling all dead weights	441,000,000	
		835,000,000
Total yearly profit from all wooden cars		$215,000,000

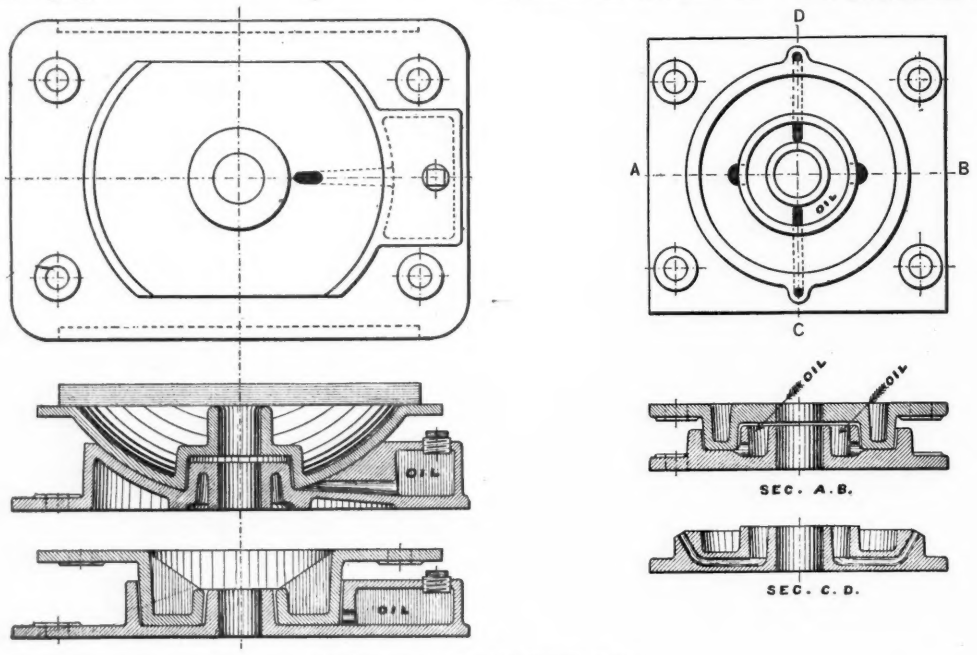
If the above mentioned lading of 37,500,000 tons were to be handled in large-capacity, light-weight steel units, we should find that the dead weight would be cut down from 21,000,000 tons to 14,000,000 tons, representing a hauling expense saving equal to $147,000,000.

The total number of Schoen pressed steel cars ordered to date is 26,412, possessing an average capacity of 47½ tons. The total carrying capacity of the above number of steel cars is 1,150,000 tons. The average weight of steel cars, as at present built, is 16½ tons, and the total weight of all steel cars to date is hence 400,000 tons.

If the above lading, viz., 1,150,000 tons were to be carried by the average wooden car, similar to the one treated in the previous computation, we should find the total weight of these cars to be 640,000 tons. We have previously found the total weight of the steel cars to be 400,000 tons, and the cost of hauling the difference between these two totals represents the saving effected by the introduction of the steel car. This difference in weight amounts to 240,000 tons, and once more assuming a rate of 3 mills, with a total yearly mileage per car of 7,000, the resulting saving in dollars and cents amounts to $5,000,000 annually. This in effect means that the steel cars are saving at least 20 per cent. of their cost each year, in addition to saving in maintenance and other profits and economies due to their use.

Lubricated Center Plates.

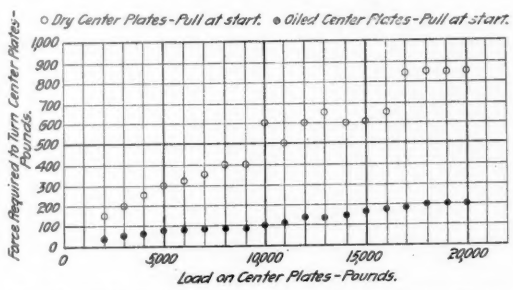
The accompanying engravings show designs of lubricated center plates which have recently been patented by the Dayton Malleable Iron Co., Dayton, Ohio, one of which was shown in the report on center plates at the last M. C. B. convention at Saratoga. The subject is to be continued by the Association for further report, and, in view of tests which Mr. C. L. Street has made at Dayton, it would seem that attention might be given to the advantages of oiling the center bearings. The design of these plates to provide for oiling is apparent from the drawings, an oil chamber being provided within the casting which is in communication with the bearing surfaces; the chamber can be filled by removing a screw plug.



The Dayton Lubricated Center Plates.

In the tests referred to, the lower center plate was rigidly fastened against turning while the upper plate was bolted to the bottom of a platform, 8 ft. 6 in. square, upon which different loads were placed ranging from 2,000 to 20,000 lbs. The force required to turn the platform was measured under different conditions of loadings. This force was applied at a point corresponding to the flange of the wheel—that is, 2 ft. 4¼ in. to the side of and 2 ft. 6 in. ahead of the center. It was found that the turning force was affected by the speed of turning, and in the tests the platform was turned as slowly as the apparatus would permit. Dry and lubricated center plates, being duplicates taken directly from stock, were tested in this way, and the results in detail have been published in a circular issued by the Dayton Malleable Iron Co. From these results we have made the accompanying diagram showing the forces, at a point corresponding to the wheel flange, required to start turning under different loads. It is not claimed that the results are precisely the same as might be got in service, but the conditions of the test approximate service conditions. There is so marked a difference between the performance of the dry and oiled center plates that the subject would seem to be one warranting further study with heavier loads.

From Mr. Street's experiments it appears that the force required to move the oiled plates is just about one-fourth that needed for dry center plates, and since preparing this diagram a mechanical engineer of a Western road tells us that tests which he conducted a short time ago gave similar results. Those tests led to the adoption of the practice of oiling car center plates.



Results of Tests With Dry and Lubricated Center Plates.

Iron and Steel Rails in America.*

BY ROBERT W. HUNT, M. AM. SOC. C. E.

(Concluded from page 507.)

Geographical and commercial conditions must govern. When the Bessemer process was first introduced in America imported English pig irons were used in making the steel. American irons were experimented with, and gradually displaced foreign irons. This practice first prevailed in the works located west of the Allegheny Mountains. They soon relied entirely upon charcoal pig, made from Lake Superior and Missouri ores. This was much higher in phosphorus than the English irons, but the results obtained from it were so satisfactory that the investigation continued and extended to the use of American mineral fuel irons, both anthracite and coke. After a time these completely displaced both foreign coke and American charcoal brands, in both Western and Eastern works.

It happened that, while the most available Western ores contained percentages of phosphorus fully up to the limit possible for Bessemer uses, the cheapest Eastern ores were quite low in that element. Hence, it has been and is a fact, that some of the rail makers east of the Alleghenies can produce rails low in phosphorus contents, while using the lowest priced pig metal. The opposite is true of the Western mills. These geographical and commercial conditions have led to the use of entirely distinct chemical specifications in the two districts—at least by some of the leading makers in those districts.

The heavier equipments and higher speeds required more rigid road beds, which could only be obtained by heavier sectioned rails. These were gradually adopted. It was naturally expected that as the sections were increased so would the resulting amount of service yielded by the rails. From the very first, the results obtained were disappointing, and the writer doubts whether we shall ever succeed in getting results as satisfactory as those yielded by the lighter sections. As the area of the section is increased, so of necessity, will the work upon the steel in forming it be decreased; and as the resulting mass is enlarged, so will the amount of heat retained in it at the time of the final reduction through the rolls be increased. In the writer's judgment it will be found that the most satisfactory results will be obtained by so modifying the rolling system that the final pass (or better, passes) shall be given after the temperature of the partially formed rail has been lowered. This is not by any means a new idea, but as yet it has not been carried out in a manner calculated to obtain the best results. . . . The satisfactory wear being given by rails renewed by the "McKenna Process" at the Joliet and Kansas City Mills of the McKenna Steel Working Company, bears very strongly on this point. . . The steel has been given finishing work at low temperature, and examination has proven that the grain of the metal in the head of the rails has been "fined." But, more important than all, the wear of the renewed rails is promising to be much more satisfactory than that obtained from new rails of heavier sections. This treatment of rails is no longer in an experimental state, as it is over five years old, and there are nearly 100,000 tons of renewed rails in service on the Chicago, Milwaukee & St. Paul; Atchison, Topeka & Santa Fé; Wabash and other large systems. One Chief Engineer, on whose road there are many of these rails, says: "No rail ought to be used at all until after it has been renewed."

The writer has already stated that, owing to geographical, and hence commercial, conditions the chemical specifications under which rails are made differ east and west of the Allegheny Mountains. In the Scranton and Bethlehem District what are known as the New York Central & Hudson River Railroad specifications, which were originally formulated for that road by Mr. P. H. Dudley, are regarded as the standard; while for the mills west of the Alleghenies, a different formula is followed. Some of the main railroad systems insist on buying under their own chemical specifications, no matter where made.

The writer has gone on record so often, as believing that in the absence of work at low heats, incident to the present method of making heavy-sectioned rails, it is important to increase the carbon with the section to as great an extent as the phosphorus present will permit, without incurring risk from breakage, that it seems unnecessary to repeat the arguments.

At the Atlanta meeting of the American Institute of Mining Engineers, in October, 1895, the writer presented a set of specifications for "Steel Rails of Heavy Sections Manufactured West of the Alleghenies." In accordance with these specifications thousands of tons have been made and used with satisfactory results. During the last two years the Western makers have declined to limit the phosphorus to less than 0.10 per cent., but, in fact, have been making steel with a fraction less than that amount, say, 0.09 to 0.096 per cent. And he regrets to say that in many cases they insist that the amount of carbon shall be less than that which he has advocated. He believes, however, that gradually, higher carbon will prevail; and, certainly, has not had any cause to change his mind on the subject.

His experience as a steel-rail maker, and as an observer of the wear of steel rails of many sections and diverse chemical composition, leads him to advocate: 1. Work, after careful heating of the steel, and continued until its temperature has been much reduced. 2. That the carbon percentages shall be increased in proportion to the increase of rail section, the ultimate amount being, of necessity, limited by the contained percentage of phosphorus. In all cases he advocates the use of drop tests, on samples from each heat of steel. At present many American engineers use the drop test, but none of them demands the static or tensile tests insisted upon by so many engineers of other countries; nor does the writer think there is any necessity for these latter. The chemical analyses and drop tests are all-sufficient.

As a matter of record, the writer gives the chemical formulas contained in his specifications of 1895, in accordance with which, as stated, thousands of tons of rails have been made and have given good results. And while at present the Western makers decline to limit their steel to 0.085 per cent. phosphorus, the writer certainly sees no reason to decrease the carbon. In other words, so many rails have been made and proved safe with quite as much carbon as given in these specifications, and with 0.10 per cent. phosphorus, that the writer does not think the former element should be made less, certainly not until the details of manufacture have been changed.

The standard specifications of the Louisville & Nashville Railroad Company are also given, as they cover both Bessemer and basic open-hearth steel rails.

The so-called New York Central & Hudson River Railroad Company's specifications are also appended; and the present standard specifications of the Western rail mills.

Robert W. Hunt's Specifications.

Section 8—The carbon in the 70-lb. section shall not be below 0.43 per cent. nor over 0.51 per cent. In the 75-lb. section not less than 0.45 per cent. nor over 0.53 per cent. In the 80-lb. section, not less than 0.48 per cent., nor over 0.56 per cent. In the 90-lb. section, not less than 0.55 per cent., nor over 0.63 per cent. In the 100-lb. section, not less than 0.62 per cent., nor over 0.70 per cent.

The phosphorus shall not exceed 0.085 per cent.

The silicon shall not be below 0.10 per cent.

The remainder of the chemical composition of the steel to be left to the maker's judgment.

Louisville & Nashville Specifications.

The steel used for rails shall contain carbon as follows: For 58¼-lb. steel rail from 0.42 to 0.52 of 1 per cent.: for 70-lb. steel rail 0.47 to 0.57 of 1 per cent.; and for 80-lb. steel rail 0.55 to 0.65 of 1 per cent.; and not more than 0.085 of 1 per cent. of phosphorus; or 0.07 of 1 per cent. of sulphur. Silicon, 0.15 to 0.20 of 1 per cent.

When the steel used for the rails has been made by the basic open-hearth process, it should be of the following chemical composition: For 58¼-lb. steel rail, from 0.45 to

*Read before the American Society of Civil Engineers' London meeting.

0.52 per cent. of carbon; for 70-lb. rail, 0.50 to 0.57 per cent.; for 75-lb. rail, 0.55 to 0.60 per cent.; for 80-lb. rail, 0.62 to 0.67 per cent. The steel used for all rails shall contain silicon from 0.10 to 0.20 per cent., 0.15 per cent. being preferred; manganese, 0.90 to 1 per cent.; phosphorus, not to exceed 0.05 per cent.; sulphur, not to exceed 0.5 per cent.

New York Central & Hudson River Specifications.

	65 Lb.	70 Lb.	75 Lb.	80 Lb.	100 Lb.
Carbon	0.45 to 0.55	0.47 to 0.57	0.50 to 0.60	0.55 to 0.60	0.65 to 0.70
Silicon	0.15 to 0.20	0.15 to 0.20	0.15 to 0.20	0.15 to 0.20	0.15 to 0.20
Manganese	1.05 to 1.25	1.05 to 1.25	1.10 to 1.30	1.10 to 1.30	1.20 to 1.40
Sulphur	0.069	0.069	0.069	0.069	0.069
Phosphorus	0.06	0.06	0.06	0.06	0.06
Rails having carbon below will be rejected	0.43	0.45	0.48	0.53	0.60
Rails having carbon above will be rejected	0.57	0.59	0.62	0.65	0.70

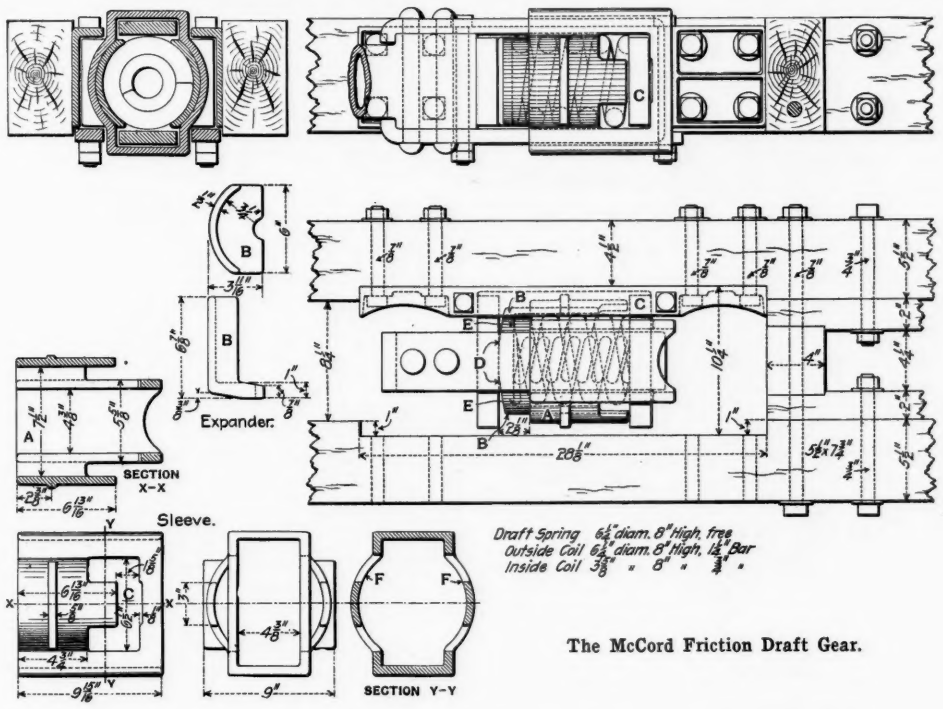
Specifications of the Western Rail Mills.

	50 Lb. up to 60 Lb.	60 Lb. up to 70 Lb.	70 Lb. up to 80 Lb.	80 Lb. up to 90 Lb.	90 Lb. up to 100 Lb.
Carbon	0.35 to 0.45	0.38 to 0.48	0.40 to 0.50	0.43 to 0.53	0.45 to 0.55
Phosphorus	not over 0.10	not over 0.10	not over 0.10	not over 0.10	not over 0.10
Silicon	not over 0.20	not over 0.20	not over 0.20	not over 0.20	not over 0.20
Manganese	0.70 to 1.00	0.70 to 1.00	0.75 to 1.05	0.80 to 1.10	0.80 to 1.10

The McCord Friction Draft Gear.

McCord & Co., Chicago, have adapted their "spring dampener" to the coil springs of freight car draft gear, so as to retard compression and reduce the recoil of the springs. Several times in recent years we have referred to the importance of controlling the recoil of these springs, especially as the capacity of draft gear is increased, and all are familiar with the work of Mr. Westinghouse in developing his friction draft gear.

The construction of the McCord device is shown by the accompanying engravings, as applied to the ordinary M. C. B. rigging. In this application the stops for the followers are cast on malleable iron pieces bolted to the draft sills. The essential parts, however, consist of an outer sleeve A and two half-sleeves, or expanders, B.



The McCord Friction Draft Gear.

The front follower, the two expanders and the draft springs are placed within the yoke, and the outer sleeve is then slipped over the outside of the yoke and the outer ends of the two expanders, the rear follower plate being driven into place in the usual way. This follower projects through the slot C of the outer sleeve, and forms a key to hold this sleeve in place, causing it to move with the yoke.

The two expanders have a bearing on the front follower at points D while the outer spring bears on the expanders at points E, tending to rock them outwardly and causing them to separate and come into contact with the surfaces F of the outer sleeve. The friction of these surfaces is depended on to reduce the recoil of the springs, and also increase the capacity of the draft gear for absorbing shocks. The action of the parts is the same under both pulling and buffing forces. The only change required in the standard M. C. B. rigging is to lengthen the yoke sufficiently to allow for the insertion of the base of the expanders between the spring and follower; this also calls for a corresponding increase in the distance between the draft lugs.

Train Lighting.

Last week we published extracts from a paper by Mr. A. Lipschutz on the use of acetylene in railroad station and car lighting, which is as clear and guarded a discussion of this method of lighting and its possibilities as we have seen. Among other things, Mr. Lipschutz concludes that the difficulties involved in generating acetylene gas on trains will probably preclude its use in that way, but that the gas generated in a stationary plant and carried in reservoirs on cars will be found superior to and cheaper than electricity and other systems of train lighting. This paper should be read in connection with one on train lighting presented at the last meeting of the Northwest Railway Club by G. D. Shepardson, Professor of Electrical Engineering of the University of Minnesota.

Prof. Shepardson takes an entirely different view, and predicts the success of electric lighting for trains, but he overvalues the importance of the work already done in the way of lighting trains by electricity. On the other hand, his objections to acetylene are met in Mr. Lipschutz's paper. After telling what acetylene gas is, Prof. Shepardson says:

"It is very apt to burn with considerable smoke, and it is very explosive when mixed with air in certain proportions or with certain metallic compounds. . . . It has come into somewhat extensive use for special purposes, such as bicycle lamps and for lighting small buildings. . . . It seems almost impossible to avoid leakage and the penetrating odor that follows. The quality of the carbide is not uniform, and there seems to be difficulty in securing contracts for the carbide with guaranteed prices and delivery covering any extended period. Acetylene has been tried in several instances in connection with compressed oil gas, it being reported that a mixture of 80 per cent. oil gas and 20 per cent. acetylene gas trebles the amount of light given by the oil gas alone. The mixed gas is not used in this country for the reasons given. . . .

"Electric lights have been used on railroad cars for a number of years, current being supplied by primary or secondary batteries, by dynamos and by a combination of dynamo and battery, but attempts to use primary batteries have been abandoned as too expensive. Storage batteries charged at terminal stations are in extensive and increasing use. Familiar examples of this system are on the 'Burlington Limited' and on two Chicago, Milwaukee & St. Paul trains between Chicago and the Twin Cities, the batteries being carried in boxes under the cars. In a number of trains current is furnished by a dynamo directly coupled to a steam engine in the baggage car, as on the 'Pioneer Limited' of the Chicago, Milwaukee & St. Paul, or on the 'Northwestern Limited.' The engine has been driven by compressed air, by gas or oil, by steam from the locomotives or from a special boiler. . . .

"The electric system which has proved most attractive and most troublesome to inventors is that in which the dynamo is driven from the car axle. This plan has been tried by a number of companies, and with varying success and discouragements. The variation of speeds encountered, and the fact that our American cars run on swiveled trucks, have made the problem more difficult than in Europe, where the coaches are without trucks. The difficulties have been overcome one at a time, and it now seems as if the axle driven dynamo was a real success. With all systems of this type it is necessary to have a storage battery to supply current when the car is standing or is running at low speed, for the dynamo will not operate until a certain speed is reached. These conditions involve difficult and interesting problems for the electrical engineer. . . .

"So far as the writer can judge, the general opinion in this part of the country is that electric lights are a great advertising scheme, and are warranted by the amount of travel they will draw or that would go to competitors better equipped, rather than by any marked economy they may show. With the experience of past years, however, and the high degree of perfection now reached by modern electrical apparatus, the writer believes that electric systems are not only as reliable and economical as any other system of lighting, but also that its well-known advantages will prove electricity the superior of any and all competitors in train lighting. The absence of open flame and reduced fire risk make it peculiarly adaptable to use in sleepers where the electric berth light alone holds a place, and also to all cases where uniform illumination is desired."

The paper is mainly a report of experiments to determine the amount and distribution of light in cars.* A Webber portable photometer was used, and about forty cars on four roads were tested, these being lighted by oil, gas, electricity and by combinations. Observations were taken at frequent intervals throughout the cars, and curves of illumination were plotted which are reproduced in the paper. The following are extracts:

"The amount and distribution of light as calculated from experiments in laboratories are unreliable, and do not represent the facts actually obtained in practice, because the candle-power of the lamps is determined in rooms specially prepared to avoid all reflection, and the lamps so tested are usually specially selected and specially cared for during the test. On the other hand, the lamps in the cars have more or less indifferent care; they vary during the run, being in poorer condition after burning several hours, the height of flame, transparency of globes and chimneys and condition of burners having considerable effect upon the amount and quality of the light; and the position of the lamp affects to a considerable extent the results produced on account of reflection, uniformity of distribution and location of lamps within the angle of vision. It was desired to measure the light falling upon a printed page in such position as passengers usually adopt, but observation showed that every passenger has his own angle for holding a book or paper and further that he is continually shifting his position to find one more comfortable. A number of tests were made to find to what extent the light at a given spot varied according to the angle at which the paper is held. As most passengers seemed to prefer a position at about 45 degrees across the seat, and as the average of the two angles at this position gave the strength of light about the same as that at horizontal position the latter was considered as giving a fair average for the illumination at the positions generally taken, and all the measurements of illumination were taken for the light falling on a horizontal surface. The cars tested included day coaches, smokers, combination coaches and smokers, reclining chair cars, sleepers, compartment sleepers, parlor and buffet cars, also two street cars. No tests were made on dining cars, mail, baggage or express cars. Arrangements have been made for tests on additional cars which may be reported later, but the results already obtained give sufficient data for deriving certain conclusions.

"Oil lamps do not give a strong light, although the variations from seat to seat are not always so marked as with some stronger lights. The strength of the lamps varied from 40.6 to 6.03 candle-power at 45 degrees down to 15 to 3.4 candle-power vertically below the lamps. The horizontal candle-power was not measured. The illumination in the oil-lighted cars varied from 1.46 to 0.79 candle-feet in the best (a day coach) to 0.035 to 0.008 candle-feet in the poorest lighted car tested (a smoker), the average illumination in any car varying from 0.0125 to 0.859 candle-feet. The average illumination on five cars being 0.545 candle-feet.

"The only cars with gas lights tested were those equipped with the Pintsch system. The light varied from 20 to 37 candle-power for four-burner lamps, to 34 to 47 candle-power for six-burner sets. The illumination varied in a single car from 2.05 to 1.05 candle-feet in the best (a cafe parlor car) to from 0.94 to 0.15 candle-feet in the poorest lighted car (a day coach). Six cars tested gave an average illumination of 1.06 candle-feet.

"In the cars with electric lights the strongest illumination was found in a compartment sleeper, where the light near the berth lamp was 6.9 candle-feet, dropping off to 2.6 candle-feet in the center. In a buffet car equipped with both gas and electric lights, when the gas was extinguished, the illumination with electric lights alone varied from 5.45 to 3.2 candle-feet. In a combination coach and smoker the illumination varied from 4.25 to 1.1 candle-feet. The average of all the cars lighted by electricity alone gave an average of 1.98 candle-feet. In the car with the poorest electric lights the illumination varied from 1.43 to 0.02 candle-feet, the lowest except at one end seat being 0.7 candle-feet. This car was lighted from storage batteries which were nearly exhausted at the time of the test, and the illumination was only about one-third of what it should be under normal conditions.

"In the cars with combination gas and electric lights the buffet car noted above had the strongest illumination, which was no less than 6.8 candle-feet at the maximum

*These observations and the report were made as a graduating thesis by F. G. Tracy and W. L. Kinsell, class of 1900, and took a prize of $50 and gold medal.

and 4.7 at the minimum when both gas and electricity were in use, the figures dropping to 5.45 and 3.2 when the gas was turned out. A reclining chair car with six groups composed of four gas burners and four sixteen candle electric lamps showed a maximum illumination of 4.0 candle-feet and a minimum of 0.91, with a general average of 2.28 candle-feet. A slightly different arrangement of the lights would have effected a marked improvement in this car. This car had both the strongest illumination found (with the exception of the buffet car noted) and also, strange to say, the lowest in any car with combination gas and electric lights, and it well illustrates the importance of a photometric study of car lighting.

"Comparing the lighting in different kinds of cars, we find among 10 day coaches examined a maximum illumination of 4.7, a minimum of 0.79 (in an oil lighted car), and a general average of 1.46 candle-feet. In eight sleepers examined the maximum illumination was 4.32, the minimum was 0.02 (in an oil lighted car) and a general average of 1.97 candle-feet. Six chair cars showed a maximum of 4.00, a minimum of 0.67 and a general average of 1.72 candle-feet. Three buffet cars showed a maximum of 6.8, a minimum of 1.05 and a general average of 3.36 candle-feet. Two smokers examined showed a maximum of 1.21, a minimum of 0.01 and a general average of 0.45 candle-feet. In the parlor and sleeping cars the smoking compartments generally had an illumination somewhat less than the main body of the car, though the disparity does not compare with that between the smokers and day coaches.

"In studying the curves of illumination found in the various cars, some interesting as well as curious results are found. In the majority of cars the end seats have the poorest illuminations. The best is frequently at the center seats, although occasionally the illumination in the center is nearly as poor as that at the end seats. The illumination at one-quarter the distance from either end is almost always the best in the car. In a few cases the illumination of the seats near the side of the car is about the same as that of the seats near the aisle, but generally the aisle seats have far better light, sometimes fully twice as much. The distribution of light from oil lamps gives better illumination for seats near the side walls. It is generally supposed that sleepers do not have so good illumination as is found in the day coaches, on account of the necessity for confining the lights to a narrow row along the center of the roof, but the tests show it otherwise, as just noted. The berth lamps help the local lighting, although the writer must confess that his experience shows that they give a disappointing illumination, probably because of the concentration of the light with the resulting glare and the comparative dimness of the surroundings. A passenger must sit crosswise of the seat and in a somewhat uncomfortable position to get the best light from a berth lamp of the encased type, unless he is reading after the berth is made up. The use of frosted globes, as is common on some roads, should help the effect of these useful adjuncts.

"The comparative illumination in the electric street cars and that in the steam cars was something of a surprise. The Harriet Interurban street cars are looked upon as being brilliantly lighted, and indeed they do present a fine appearance on the streets at night. They look bright whether viewed from within or from without. Yet the actual measurements show that the cars on the limited trains leaving the Twin Cities for Chicago every evening (at least on the roads studied) have an illumination several times as strong. The apparent illumination of the Harriet cars is enhanced by the large amount of window surface and by the proportionally large amount of polished woodwork inside.

"The average illumination by the different systems is found to be as follows:

1. Gas and electricity combined....	average	2.89	candle-feet
2. Electricity alone	"	1.98	"
3. Gas alone	"	1.005	"
4. Oil	"	0.545	"
5. Carbureted air	"	0.144	"

"The comparison in regard to uniformity of illumination gives the following ratios between minimum and maximum values in any one car:

1. Gas and electricity combined.....	0.528
2. Electricity alone	0.457
3. Gas alone	0.410
4. Oil	0.338
5. Carbureted air	0.102

"It is thus seen that the method which gives the most light also gives the greatest uniformity as a whole, and that the five methods of lighting have the same order in both comparisons. While the relative differences are less in the first system than in the last, the actual differences in the first system sometimes amount to as much as or more than the total illumination with the last named system. As percentage of variations is really the test of uniformity, this is adopted as the correct basis.

"Another comparison of interest is the variation of illumination at adjacent seats. In this regard sleepers cannot be compared with other cars on account of the different arrangement of seats; in cars other than sleepers the readings between the end of the car and the first lamp (or between the two end seats) are omitted in the following table, as the curve of illumination has not yet obtained its average value, and it is not thought that this result is desired so much as the variation in the body of the car. The values of the larger divided by the smaller at the point of greatest variation, omitting end seats, are as follows:

1. Electricity	1.25
2. Gas and electricity.....	1.31
3. Gas	1.63
4. Oil	1.84
5. Carbureted air	2.33

"The great advantage of electric light is here shown, as it comes first in point of uniformity, a result of using many lamps of small candle-power instead of a few lamps of large candle-power.

"In general lighting practice it is found that an illumination of one candle-foot gives a fairly good light for reading, while one-half a candle-foot may be used, and one and one-half gives what may be called a very fine light. Anything below a half candle-foot would be called a very poor light, and anything above one and one-half is good mainly for advertising purposes, although it adds to the pleasure and comfort of a traveler to a certain degree."

Janney Couplers for European Cars.

Among Paris Exposition exhibits of the McConway & Torley Co., Pittsburgh, Pa., are applications of the Janney coupler to the central-hook and side buffing arrangements of European draft-rigging. In Fig. 1 are

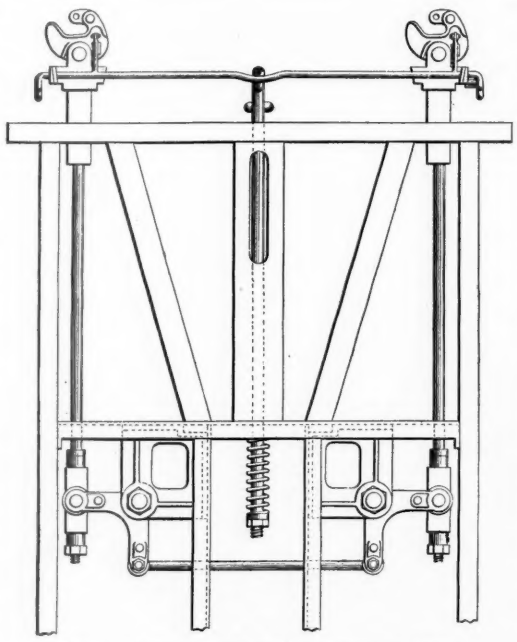


Fig. 1.—Janney Couplers for European Cars.

shown the under frame and draft gear of an English and continental car, with Janney couplers so arranged as to work in pair, independent of the original coupling-bar, which is temporarily retained. The Janney couplers are substituted for the side buffers, and so related that they may serve as buffers and couplers on curves as well as tangents and without interfering with the original coupling. This result is obtained by the simple equalizing arrangement shown and by pivoting the head of the coupler.

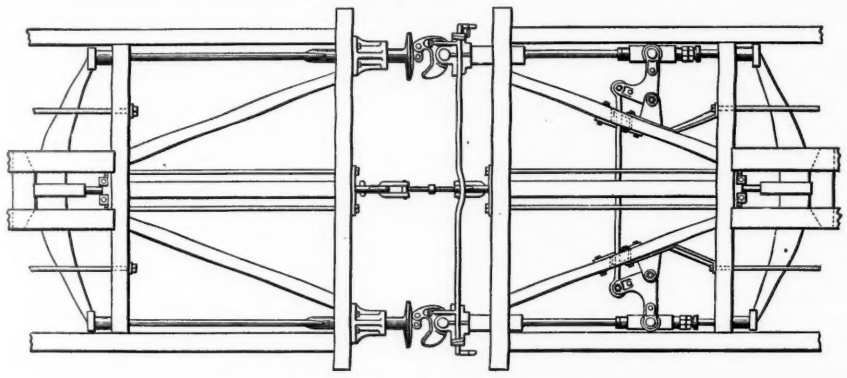


Fig. 2.—Janney Couplers for European Cars.

Fig. 2 shows a car end equipped as above described, and brought in contact with a car end having the original buffers and coupling bar. It is apparent that the arrangement cleverly meets the needs of that interval in which the transition from hand-operated to automatic couplers would make it necessary to use both kinds of couplings in common.

Pig Iron Production in the United States.

According to the statistics of the American Iron and Steel Association the total production of pig iron in the United States in the first half of 1900 was 7,642,569 gross tons, against 6,289,167 tons in the first half of 1899 and 7,331,536 tons in the second half. But the enormous production of the first half of 1900 will not be continued in the second half, as demand has slackened. A check in production began in June, when some furnaces were banked and others were blown out. The production of Bessemer pig iron in the first half of 1900 was 4,461,391 gross tons, against 3,788,907 tons in the first half of 1899 and 4,413,871 tons in the second half. The production of basic pig iron in the first half of 1900 was 581,868 gross tons, against 482,389 tons in the first half of 1899 and 502,644 tons in the second half. The production of charcoal pig iron in the first half of 1900 was 167,146 gross tons, against 128,485 tons in the first half of 1899 and 156,281 tons in the second half. The production of spiegeleisen and ferromanganese in the first half of 1900 was 148,102 gross tons, against 104,496 tons in the first half of 1899 and 115,272 tons in the second half. The whole number of furnaces in blast on June 30 was 283, against 289 on December 31, 1899. The number out of blast on June 30 was 128, against 125 on December 31, 1899. Unsold stocks in the hands of manufacturers or their agents on June 30 amounted to 338,053 tons, against 63,429 tons on December 31, 1899.

Grain Doors.*

The grain door subject is knotty and difficult of solution. He who finds a remedy for the present method of confining grain and other products requiring protecting boards will, or should, receive substantial reward. Can this be done with the patent or permanent door? The writer is skeptical, and does not believe this is possible unless accomplished at too great expense. The author will not attempt to state how many letters patent have been granted for such devices, but he feels safe in saying almost as many as of automatic car couplers. Some of them have merit, but all are subject to the one objection of being too expensive, considering their short life. They range in cost from eight to twenty dollars per door, and from sixteen to forty dollars per car.

Another objection to such doors is the fact that they cannot be readily raised with the load pressing against their sides, and, as a natural consequence, the elevator man, who has no time or patience to waste, will force an entrance the quickest way, which usually is to cut a hole in the obstinate barrier or else totally wreck it, and pass on to the next with probably the same result. One door, said to overcome the necessity for such harsh measures of opening, is so arranged that the doors can be raised with chain and windlass attachment located at each end of car. While this door may have overcome the objection mentioned, there must have been other or more serious objections to its existence, as I have been unable to learn of any in use at this time. Still another door, which was in use on several important lines for short periods, was arranged on the principle of a folding desk. The cost of this protector must have been considerable and its life and usefulness shortened by the arch enemy of wooden doors (the man with hammer and nails).

Another door, used by one large system at least, is designed with a view of avoiding the use of nails for holding it in place. This door is worthy of more than passing notice; its arrangement is such that the sliding rods are set in flush with the door posts, and therefore safe from displacement; it is strongly made, and, with fair usage, would last several years. The faces of door posts are plated with iron to permit raising of door with little effort and to obviate the use of nails. The author examined a set of these doors in an 80,000 capacity car that had been in the service, perhaps, four months. He counted thirty-four nails and spikes of various sizes driven in one door and forty-two in the other. The aprons of each door were almost wrecked and worthless from this cause. The nails were placed where there could be no possible need of further security than that already provided for. It would appear that the "nail driver" desired to impress upon the inventor the fact that his door was not non-destructible.

There is also a metal door in the market and a few in use, but it has not been the good fortune of the writer to see it, or to have an opportunity to inquire into its usefulness. Such a door would certainly overcome many of the objections pertinent to the wooden device, as it would defeat the nailing mania.

An elevator man is the inventor of another door, which he contends will overcome many, if not all, the objections to the class of doors mentioned above. It is in use in a limited number of cars at the present time with good satisfaction, so it is claimed. The patentee says the idea was suggested to him by reason of the wanton destruction of doors by his elevator employees, who, when remonstrated with, demonstrated the fact that a majority of the doors could not be removed without destroying or seriously impairing their further use. The main principle of this door is that it opens outwardly at the bottom 15 to 18 in., which is sufficient

*Extracts from a paper by H. C. Barnard, Superintendent Terminals, L., E. & St. L. C. R. R., read before the Central Association of Railroad Officers, at Louisville, Ky., July 18, 1900.

to release the load in any event. When not in use it fastens to the roof of the car. With this door there could be no occasion for use of bar in raising. The process of releasing at the bottom is quite simple, and can be quickly done without force or tools of any kind. One possible objection to this door is, whether it is strong enough to withstand the strain against it from the inside; if not, this defect should not be insurmountable. Its cost should be another factor in its favor, as it can certainly be made as cheap, or cheaper, than any door in the market.

The patent or permanent door has many qualities to commend it, and when proper attention is given to its maintenance the road so fortunately equipped, has an advantage over a line whose cars are not so equipped, for the obvious reason that its cars are always ready for any service for which they may be needed. This factor at a large terminal means much in the saving of time, as the cars have to be switched to repair track or point at which temporary doors are applied, and again, no bills can be rendered for doors against the line which has its equipment in this ideal stage of perfection.

The writer has been unable to get from any source figures showing the cost of maintaining permanent grain doors. The experience of the writer has been solely with the temporary door. He has found them to cost from sixteen to thirty-six cents per door. In cars of 60,000 capacity or above it is safe to add one-third more to the total cost. This does not include the labor of placing or the expense of switching. The former expense has been as high as thirty cents and as low as four cents per car, depending on the class of labor employed, and the distance material had to be moved.

While this item of expense to a large grain carrying line is considerable, and liable to further increase by reason of scarcity of timber, there seems nothing to do but to bear it. The usual method of prorating expense of grain doors between connecting lines is on a revenue basis, although I believe there are exceptions to this practice. One large system takes the position that it will not participate in such expense; that it will apply the doors to all cars needing them that may be loaded on its line, and will expect connections to do the same. It is difficult to understand how this position can be maintained against a competitor following contrary practice.

Considering the question from all standpoints, it is the opinion of the writer that cars can be grain doored much cheaper by the carrier than by the shipper or elevator people, and that it is preferable to do so; also, that with all faults, the temporary door is at present more economical than the patent or permanent door.

The Effect of Scorching on Ductility.*

BY WM. T. MAGRUDER, M. E.

Herewith are presented the record and a copy of the autographic stress-strain diagrams obtained from coupons cut from the front, center and back, respectively, of the crown sheet of a Belpaire locomotive boiler. The locomotive was first put into service in July, 1894. In December, 1897, it was slightly scorched or overheated, due, in all probability, to low water. It became badly pocketed between the heads of the crown sheet stays, but there was no explosion or giving way of the sheet. The plate was purchased on specifications calling for 55,000 to 65,000 lbs. per sq. in. of tensile strength and 28 per cent. elongation in 8 in.

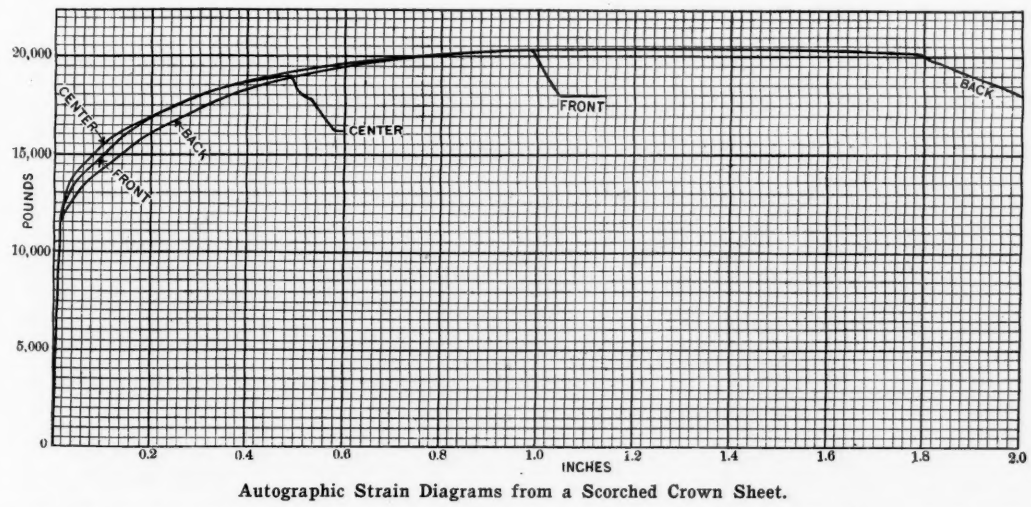
TABLE I.

	Front.	Center.	Back.
Size, inches	1×0.335	1×0.337	1×0.324
Area before testing, sq. in.	0.335	0.337	0.324
Area after testing, sq. in.	0.240	0.271	0.144
Per cent. reduction in area	28.4	19.6	55.55
Strength, lbs. per sq. in.			
At elastic limit (=y P.)	380,60	37,090	37,040
At maximum	603,00	56,380	63,270
At final	547,30	48,960	52,470
Elongation in 8 inches	1.09	0.53	1.97
Per cent. of elongation	13⅜	6⅝	24⅝

The tests and autographic diagrams were made on an Olsen 100,000-lb. automatic and autographic screw machine. The report tells the story in figures, and the diagrams illustrate them graphically. It is to be noted that the 28 per cent. elongation (when new) in a test section 8 in. long is reduced to 24⅝ per cent. at the back test section, to 6⅝ per cent. at the center, and to 13⅜ per cent. at the front test section, after the use that it received; that the reduction in area is reduced from 56.9 per cent. at the back, to 19.6 per cent. at the center, and to 28.4 per cent. at the front test section; and that the maximum strength is reduced from 63,270 lbs. per sq. in. at the back to 56,380 lbs. per sq. in. at the center. The center coupon showed the highest modulus of elasticity. It gave a rounded diagram, whereas the back coupon gave a sharp corner at the yield point.

The center coupon, after fracture, shows a ruptured or checked surface, on the side of the plate which was next to the water, in places originally about 4 in. apart and midway between the crown stay rivets. It is quite uniformly but less deeply checked on the fire side. The front coupon is checked only on the fire side, and only near the place of fracture which is at a line of rivets.

While the sheet did not give way and cause a steam boiler explosion with the attendant loss of life and property, the tests show that the ductility of the sheet had been practically destroyed, and confirm the judgment of the person who ordered it to be replaced.



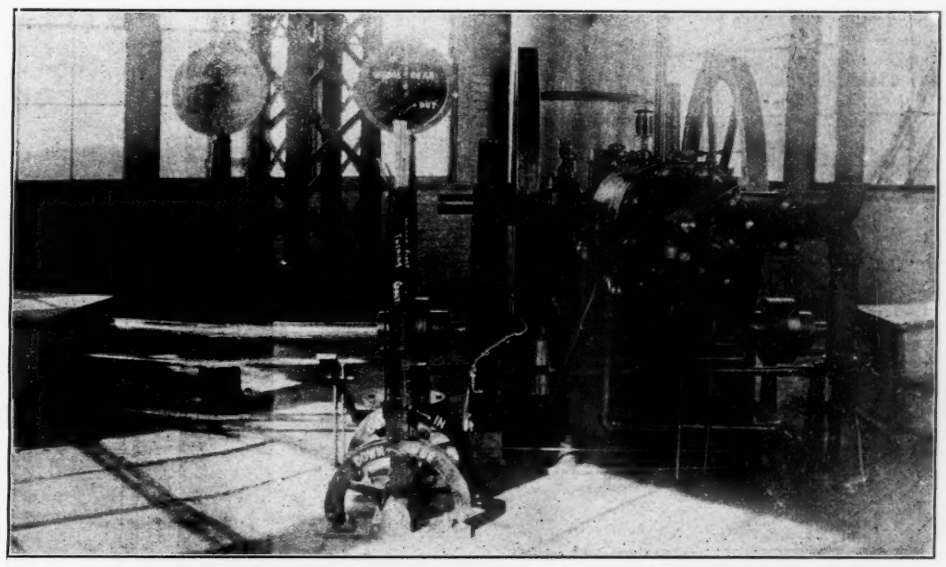
Autographic Strain Diagrams from a Scorched Crown Sheet.

*Reprinted from the Stevens Institute *Indicator*, July issue.

Draw Span Driven by a Gasoline Engine.

Fairbanks, Morse & Co., Chicago, have equipped a number of drawbridges during the past two years with a special turning gear, direct-connected to a gasoline engine, which arrangement appears to be particularly suited to isolated bridges or those which are turned infrequently, although a variety of conditions have already been met. One of the largest installations of this kind is the Louisville & Nashville bridge over the Tennessee River at Danville, Tenn., which is shown by the accompanying engravings. The draw span is 393 ft. long, weighs 540 tons, and the operating house is located at the center about 20 ft. above the rails.

Referring to the interior view, it will be seen that the engine is located in the center of the house, and a shaft, extending in either direction, connects with the vertical shafts which drive the turning mechanism and the mechanism for drawing the wedges. Levers are placed near the engine which operate friction clutches, one lever operating the clutches for the turning mechanism and the other the wedges. One quadrant is marked showing whether the bridge is being turned up or down stream, and the second lever shows whether the wedges are being thrown in or out. The indicator dials are arranged on stands, indicating the position of the bridge. A double pointed arrow is provided showing the position which the bridge occupies in relation to the abutments, and the arrow of the second dial indicates the position of the wedges at any instant.



Interior of Engine House—Louisville & Nashville Draw Bridge.

But one man is needed for operating the machinery and the engine. The engine has a self-starting mechanism, and is a 34 h. p. horizontal slow-speed gasoline engine, provided with a speed-changing device so that the bridge is started slowly, the speed then being gradually increased at the will of the operator. The controlling features are said to be very satisfactory. The bridge can be opened in from two to three minutes with safety, although the machinery is of such capacity that the time could be reduced, but due to the length and weight of the span the above time is considered adequate. Similar machinery has also been installed on plate girder bridges and at points where the service is quite frequent. In such cases the engine is kept running all of the time, but at the Louisville & Nashville bridge the engine stands idle, and one-quarter of a minute is usually taken for the start. The engine, however, was started at the trial in twelve seconds, when the engine was cold.

Draw Bridge Turned by a Gasoline Engine.

Kansas City Freight Terminals.

This was the subject of a paper before the Central Association of Railroad Officers at its recent meeting in Louisville by Mr. F. B. Parker, Superintendent of Terminals of the Kansas City Suburban Belt Railroad.

Mr. Parker began by reminding his hearers that Kansas City was no longer a wild Western village, although one of the Eastern delegates to the recent National Democratic Convention in that city took along his gun, thinking that he could have a deer hunt while there. Kansas City now has a population of 300,000, and there are 510 miles of railroad track in the city, which includes private tracks to packing houses, stock yards, etc. On this track 110 yard crews work every day, and the number of freight trains sent out is 304. The average daily movement of freight cars is 11,000, and there are 200 passenger trains. Nearly all the freight yards and prominent industries are in the West bottoms, within a territory of about one square mile, so that nearly the whole freight business of the city is done in this area. The Kansas City Stock Yards are the second largest in the world. A prominent feature of the business of the city is the wholesale business in agricultural implements. The farmers west of the city do not dare to make heavy purchases until the safety of their crops is assured; but when this time comes, then they want carloads of harvesting machinery and other implements on very short notice, and enormous shipments of these goods are often sent out of the city on the evening of the same day that the orders are received by the merchants. In Kansas City, L. C. L. shipments, as well as carloads, are transferrd from one road to another in cars, and the arrangements for this work are so well made that most transfer freight is sent out of the city the same day that it comes in. Mr. Parker thinks that every new, growing city ought to try to concentrate its railroad yards on the pattern of Kansas City.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS

CONTRIBUTIONS—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

During the month of July, orders were noted in our news columns for 6,070 cars of all kinds and 40 locomotives, which is an increase over the cars ordered the previous month and about the same number of locomotives as were then ordered. The car orders are divided as follows: Box, stock and refrigerator cars, 2,910; coal and ore cars, 2,624; flat cars, 358; tank cars, 20; steel cars, 100, and passenger cars, 58. There were 20 passenger, 17 freight and 3 switch engines ordered.

About a week ago the most common headline in the railroad columns of the daily newspapers was "Peace and Harmony; Cutting of Rates Comes to a Sudden Stop"—or words of similar import. Numerous traffic men gave information of this kind to the reporters. One prominent officer said: "The present rate situation is excellent. There is a better understanding among the lines and there seems to prevail a general determination to maintain tariff. The Trunk Line situation westbound is decidedly firm, and it has been so for a long time. The eastbound situation has very materially improved, and the indications are that it will remain so for some time to come. The Western roads are gradually getting in better condition, and, taken altogether, the general situation is the best we have had in years. So far as I can judge, I believe that present conditions will prevail for some time to come and the outlook consequently, in my estimation, is excellent." Asked what had caused this sudden and sweeping change in the situation, he said: "The general determination on the part of the railroads to maintain the regular tariff is largely due, I presume, to the community of ownership that has been brought about, in the West as well as in the East. A large number of the principal railroads are now controlled by a few powerful interests, and the application of sound business principles is being insisted upon. The men in control have set their faces against wasteful rate warfares." A prominent President said: "The outlook for the current year is very promising. To be sure, there is a considerable falling off in tonnage just now, but that is more than offset by the splendid way in which rates are now maintained both eastbound and westbound. The rate situation is an ideal one. I have not known a period in my thirty years of railroading in which the freight rate situation was in better condition." These are encouraging words, and yet we are not sorry that we omitted to publish them last week, for this week it appears that considerable shading of provision rates is practically admitted at Chicago; and *some* irregularity evidently has existed all along. We do not belittle the facts or opinions given out by these well-informed executive officers; but it should be noted that the improved conditions are not due to any increased respect for Mr. Knapp, or for the law which he is set to administer. When the strong roads will maintain rates, in spite of secret cutting by the "other fellows," headlines like those which we have quoted will afford great satisfaction to thousands of people; but as long as the encouraging condition, such as it is, is due to the fact that not much grain is moving, and that the only traffic left to fight over makes a small volume in proportion to the whole earnings of any road, let us take care to note that the thing which we are pleasing ourselves with is hope—not any accomplished change. But the hope is a very substantial one, notwithstanding all unfavorable appearances.

Defects in Coupler Unlocking Gear.

Last December, (page 862), we published some facts obtained by an inspector of the Interstate Commerce Commission concerning defects in the unlocking gear of M. C. B. couplers. The examinations then reported on had covered the better part of two months, ending December 1, 1899, and the observed defects in this part of the car fixtures were tabulated as below:

Uncoupling lever chain broken	513
Uncoupling lever chain too long	59
Uncoupling lever handle too close to car	227
Uncoupling lever bent and binds	81
Uncoupling lever missing	18
Uncoupling lever broken	12
Uncoupling lever keeper gone	71
Uncoupling lever keeper loose	366
Total defects	1,347
Total defective cars	1,264

The inspector explained that he was positive that he could only get a small proportion of the defective couplers from the very nature of the conditions under which he had to make his inspections; but even his superficial and incomplete examination showed 1,264 cars on which the unlocking gear was so defective that the men working in the yards were put to inconvenience and often subjected to actual danger. In writing at that time we said that a gentleman having authority in such matters ventured the guess that this part of the coupler gear is defective in perhaps 75 per cent. of the cars running.

We now have a report from the Commission covering the period from Oct. 8, 1899, to May 30, 1900, and the chief results appear in the table below:

Uncoupling lever chain broken or gone	1,797
Uncoupling lever chain too long	763
Uncoupling lever handle too close to car	608
Uncoupling lever bent and binds	525
Uncoupling lever missing	77
Uncoupling lever broken	19
Uncoupling lever keeper gone	206
Uncoupling lever keeper loose or broken	1,163
Miscellaneous defects	136
Total defects in uncoupling gear	5,294
Total defective cars	4,618
Total cars inspected (estimated)	14,000

In the report now before us there is nothing to indicate the conditions under which the inspection was made, and nothing to show the inspector's opinion as to how near he came to catching all the defects of this class. In his report of the first two months' work he explains that "when inspected the cars are generally in strings, or made up in trains coupled up, making it impossible to give each coupler a thorough examination. Only the cars at the ends can be thoroughly examined, as it would not be allowable to uncouple the cars in other portions of the train for examination. Defects reported are largely those which can be noticed in passing by." We should suppose that there was no change in these conditions for the rest of his work, and that he does not assume that he saw more than a small percentage of the coupler defects that actually existed in the cars which he passed in this hasty review, but he saw enough to prove that the conditions which he discovered last autumn are not unusual, but are characteristic.

His journeys on this duty covered the United States from the Atlantic to the Rocky Mountains, and from the Lakes to the Rio Grande. He visited yards big and little in all that great area. The cars which he found defective are designated by owner and by number. There is no doubt of the extent of his observations; and their accuracy can easily be verified. Indeed, we have essential acknowledgment of their accuracy in extracts from letters received by the Commissioners from railroad presidents and managers after they were informed of the results of the inspection. These gentlemen, in any case that we discover, do not deny the fact; generally they express an intention to make matters right.

The condition then is acknowledged and proved to be pretty bad, and what are you going to do about it? In writing before we expressed the idea that it is a mistake to seek relief in additional contrivances in the nature, for example, of a lock-set within the coupler head, and that there are already enough parts about the coupler rigging, and that further invention, if any is needed, should be in the direction of simplicity. We expressed the idea that it would be a mistake to try to transfer any function from the exterior, visible and easily accessible unlocking gear to the inside of the coupling head. This must add to the difficulty of inspection and of repair. An analysis of the table then, like an analysis of the additional figures now published, will show that the trouble does not arise from lack of parts to keep in order. We find, for instance, that about one-half of the total defects are chain broken, missing or too long. No new contrivance would help those defects. Again in 600 cases the handle was too close to the car, and in 500 more it was bent and binding against the brake rod or some other part. It is hard to imagine any new contrivance that would correct those defects. In brief, so far as we can judge, the only remedy in sight is to see that the gear is well put on, and then that it is properly watched and maintained.

The Qualities and Life of Rails.

On December 10, 1895, a serious railroad accident took place on the Great Northern Railway in England. A fast express was derailed, and it was found that two rails were broken, and the derailment was attributed to the breaking of these rails. These were steel, bull-headed rails, had been in track 22 years, were originally 80 lbs. per yard, and when broken weighed 70 lbs. and 72.3 lbs. per yard respectively. The loss in height by wear had reached as much as 5-16 of an inch. One of these rails broke into 17 pieces, and none of these were more than 22 in. long. The other rail broke in four pieces. This was the famous St. Neot's accident, one result of which was a lively and protracted discussion as to whether or not steel rails deteriorate in use and become brittle.

In May, 1896, the British Board of Trade appointed a committee to inquire into this question of the life of steel rails under prolonged use. In this committee will be found some eminent names. It was made up of Lord Blythswood, Sir Benjamin Baker, Sir Isaac Lowthian Bell, Prof. Wyndham Dunstan, Prof. A. B. W. Kennedy, Col. Sir F. A. Marindin, R. E., Mr. E. P. Martin, Prof. W. C. Roberts-Austen, Dr. T. E. Thorpe, Prof. W. Cawthorne Unwin, and Mr. Edward Windsor Richards. Last March, four years (less two months) after the appointment of this committee, the report of its labors was submitted to the Board of Trade. The conclusions we printed July 27, page 510, but we will repeat the chief points for the convenience of those who missed the earlier publication, and then give a running summary of a few of the most interesting facts brought out. The report is as a whole a most interesting and a really valuable document of 124 pages, with many fine plates showing the appearance of etched sections of steel.

Conclusions.—With regard to chemistry the committee indicates no limits, but refers to the limits suggested in the evidence received from various railroad companies. In a broad sense, brittleness of steel does depend on the total amount of phosphorus present, as that element may exist in steel in at least two different forms, one of which is comparatively innocuous.

Steel possesses a complex structure, the nature of which will vary greatly with mechanical and thermal treatment. The durability of the rail depends in great measure on its structure, which may be revealed by the microscope. The structure of the St. Neot's rail can be exactly imitated.

Most rails break near the ends. Hence the conclusion that the greater strain due to interruption of the rail at the joint contributes to breaking. This can be helped by using rails of sufficient strength with webs of ample thickness and with good fastenings, and taking care that no looseness arises in service.

Worn rails are improved in strength and ductility by annealing, which suggests that part of the deterioration of rails in service is of the nature of what is sometimes termed "fatigue."

It is certain that some fractures have been due to fissures formed in service. How far minute transverse fissures, as often noticed in the running surface of old rails, cause induced flaws, should be further investigated. It is not likely that they usually spread into the substance of the rail; fractures would be more frequent if that were the case. Evidence as to the existence of visible flaws or defects in broken rails is very conflicting. In some cases undoubtedly the combined effects of weakening from wear and corrosion, increased strain from defective tamping and the presence of a flaw or fissure have led to fracture. That such defects appear most commonly in the head is some evidence that they are induced by the hammer hardening of the top surface.

It is very desirable that mechanical tests should be standardized in connection with the weight, the section and the mechanical composition of the rail.

The committee as a body agrees with these conclusions, which were drafted by Sir William Roberts-Austen and Dr. Thorpe as to chemistry, and by Prof. Unwin, Sir Benjamin Baker and Prof. Kennedy as regards the mechanical study. The committee thinks it not desirable to insist on too high a proportion of carbon, manganese or silicon, having regard to the ordinary contingencies of manufacture and greater susceptibility of high carbon steel to thermal influences.

Synopsis of the Report.—The committee sought information from foreign countries and learned that in Germany trial stretches of track had been laid and carefully observed, beginning in 1891. The time elapsed is not enough to permit useful conclusions to be drawn. In Austria-Hungary, on the State Railroads, a regulation exists requiring rails to be renewed when they have been worn off six millimeters, the ordinary height of the rail being 125 millimeters. The French Government sent to the committee a statement of a conclusion reached by the Public Works Department to the effect that renewal is required when the wear of the rail is such that the moment of inertia is insufficient. As for deterioration of the metal, French experience shows that it is to be feared the less as the metal itself is the more pure and homogeneous. When steel contains but little phosphorus and silicon and when it has been well made, breaks are very exceptional and do not appear to be the consequence of any molecular change in the metal.

The committee decided to make a series of experiments on worn and broken rails, making falling weight tests, tensile and bending tests, chemical analyses and examination by photomicrography. Tests were made at the works of the North Eastern at Gateshead and of the Lancashire & Yorkshire at Castleton. From these tests 16 rails were selected for further investigation by Prof. Unwin and Mr. Windsor Richards. Specimens cut from these rails were sent to Prof. Unwin for mechanical tests, to Dr. Thorpe for chemical analysis, to Sir William Roberts-Austen for photomicrographic examination, and to Prof. Dunstan for atmospheric corrosion tests. The reports of all of these gentlemen appear in various appendices.

Sir William Roberts-Austen found in samples of the St. Neot's rail patches of "Martensite," and in order to ascertain whether this characteristic constituent of hardened steel can be produced by other means than by quenching from a high temperature, he examined a portion of a tube of a 4.7-in. gun. He is satisfied that the conditions which prevail in the gun produce changes which resemble the local changes found in the St. Neot's rail; but they do not enable local patches of "Martensite" as occurring in this rail to be attributed to any other known cause than quenching from a high temperature. The structure of this rail is evidently abnormal.

In addition to the experiments carried out by the committee, Sir Lowthian Bell tested a large number of rails, and writes a special memorandum on these tests. He calls attention to the small proportion of rails broken in Great Britain, which he estimates as annually one to every 25,000 laid down.

Mechanical tests for hardness were made. Tabulating the results of these, it is ascertained that in general the mechanical hardness and the total carbon as determined from the chemical tests follow in the same general order. Exceptions are generally explainable if the amount of phosphorus and manganese is taken into account. The lowest index number of hardness is 195.3, and the highest is 256.2. The carbon in this softest rail is 0.329 and in the hardest rail 0.415; but a rail with 0.454 has a hardness number of 236.3 with high phosphorus. The highest carbon tabulated in those special tests is 0.542, the hardness number being 246.4. Here again the phosphorus is indicated as high. In all rails with a greater hardness number than 215 the phosphorus is above 0.7. "Manganese appears to have a less definite hardening effect, but the two hardest rails contain very high per centages of manganese." One of these has 1.444 of manganese, which is the highest of any rail tested. "In mechanical and in microscopic tests the rails can be distinguished into a softer and a harder class, but so far as the mechanical tests go there is nothing to indicate that the one class is better than the other. Rather, on the mechanical tests, the harder rails might be considered as, on the whole, more satisfactory than the softer rails."

Sir Lowthian Bell's drop tests gave some interesting information. The falling feet to which each rail was subjected were ascertained by adding up the several falls in feet, of a ball of one ton, the last blow being taken at one-half its real height because the exact extent of the energy absorbed in effecting the fracture is, of course, unknown. We find a rail with carbon 0.45 and phosphorus 0.047 breaking with 35½ falling feet. On the other hand, a rail with 0.51 carbon and 0.083 phosphorus endured 155½ falling feet. Another one which stood 199 feet without breaking had carbon 0.49 and phosphorus 0.085. Sir Lowthian Bell concludes that "a very moderate amount of attention to these figures will disclose the fact that so far as phosphorus and carbon are concerned, power to resist fracture is not determined by the higher proportion of these elements." And again, other observations "justify the conclusion that a comparatively high rate of phosphorus does not necessarily imply a reduced power of resisting fracture." Eight specimens with an average phosphorus content of 0.105 broke with 34.81 falling feet, while specimens containing only 0.071 phosphorus broke under 16 feet. The famous St. Neot's rail had phosphorus 0.091, carbon 0.453, manganese 0.471, sulphur 0.065, silicon 0.094. "Not only do the analyses fail to show any uniformity in connection with breakage and composition, but there are wide differences in the behavior under the test of two pieces of the same rail."

Sir Lowthian Bell finally says: "Having regard to all the circumstances which have been elicited during the present inquiry, I do not think that the Rail Committee should recommend any change in the mode of management of the permanent way of the railways in the United Kingdom."

A considerable number of questions addressed to railroad companies brought answers, which, as they were deliberately made in writing, must be taken as having authority, and yet they show singular discrepancies. For instance, nine companies say that fractures occur most frequently in the bolt holes. On the other hand, six companies say that fractures occur occasionally through the bolt holes, or sometimes, or even not at the holes. There is pretty general agreement that fractures do not occur at the chairs, but between two chairs.

About 14 companies say that fractures show evidence of a previous fissure or defect either usually or often. One company says that fractures practically always show such evidence. Another company says that about 61 per cent. of broken rails show flaws or other defects. Yet one company, the Midland, has observed very few such cases; another company has observed none. Still another company says that instances of breaks with defects are about equal to the number of breakages without defects. Another company says there are very few cases showing previous fissure or defect; another company says not as a rule.

Very rare instances are reported of rails breaking into several pieces. The Great Northern, in fact, says that the only case in its records is that of the St. Neot's rail.

The carbon limits of the companies run from 0.25 up to 0.5, the phosphorus from 0.05 up to 0.08.

One important question is as to whether hard or soft rails are best as regards either wear or safety. The decided majority of opinion is that harder rails wear better, but there is a tendency to believe that softer rails are somewhat safer. This, however, seems to be simply accepting and taking for granted a general opinion without applying definite knowledge. Concerning this we shall have something to say later.

The appendix on the evidence afforded by the chemical and micrographical examination attaches much importance to the necessity for exercising the utmost care in the removal of crop ends. It seems quite certain that in many cases fracture is not due to defective chemical composition. It seems quite clear to this sub-committee that the peculiar and "so far as we know, exceptional mode of existence of the carbon in the St. Neot's rail was a contributory cause of the fracture." This sub-committee thinks it probable that a great improvement might be effected by reheating the finished rail after rolling, and, further, that it seems almost certain that except in a broad general sense the brittleness of steel does not depend upon the total quantity of phosphorus present.

Annual Reports.

The Cape of Good Hope.—The General Manager of the Railways of the Cape of Good Hope sends to us a copy of the report on the working of those railroads submitted by him last April, the report being for the calendar year 1899. The length of line on December 31 was 2,661¾ miles, 32¾ miles of this being double track. Of this practically 1,026 miles was cut off through the operations of the war, although that part of the Rhodesia Railway north of Crocodile Pools and extending to Bulawayo was uninterrupted and available for traffic.

The working year included the first three months of the war. For one-quarter of the time reported on all of the territory served was in a state of war, and 436 miles of the Cape Government Railways were actually under the control of the Boers. The traffic with all the country north of Kimberley, with the Free State and with the Transvaal was suspended; yet in that year these railroads earned net 4.6 per cent. on the capital entitled to interest. In other words, the revenue lost was to some degree made up by the special traffic due to the movement of troops and supplies, and the net earnings were actually $109,000 more than in 1898.

The sudden strain brought upon these railroads was very great. The German General Staff calculates that not more than 40,000 troops can be fed by a single line of railroad, but in Cape Colony more than three times this number has been served, and well served, and that without great interruption of civil traffic. Naturally, the deterioration of the property must have been serious for rolling stock, and track must have been pushed to its utmost, regardless of repairs. The General Manager doubts if a sufficient quantity of rolling stock has been ordered to meet the requirements of traffic for some time to come. During the year 12 engines were ordered, but none had been delivered late last April, while 39 more engines and about $800,000 worth of freight trucks and other rolling stock were under order, but it will be six months before these will begin to arrive and 18 months before the last orders will be executed. The General Manager believes that at the close of the war very large quantities of merchandise, machinery, etc., will have to be conveyed to replenish stocks that have run down to a low ebb. The engines have been worked to their maximum power, and it will be difficult to keep them up without considerable addition to the present stock.

The cost of working has, of course, been increased by the war. The local supply of coal has been shut off, the mines having been held by the enemy, and the railroad has been obliged to depend mostly upon Welsh coal. The price of this has risen from £1 13s. 2d. per ton at Cape Town to £2 11s. 7d. Now, however, the colonial mines have been recaptured, and probably before this time they are turning out a considerable quantity of coal.

In the southeastern part of the Colony several lines are building, which were described at some length in our issue of Aug. 19, 1898. These aggregate about 375 miles. Concerning them the General Manager says that the contracts have been executed in a more unsatisfactory way than any with which he ever had experience before, and the delay has been great. A new contract has been drawn altering the line between Somerset East and King William's Town from a subsidized to a government contract line, and the mild hope is expressed that the work will now be carried on there with more vigor. Naturally, the construction of other lines has been retarded by the fact that rolling stock has been needed for military purposes.

We observe that experiments in lighting by acetylene gas have not been successful. The pipes became choked with carbon, and the burners had a hard incrustation formed upon them very soon after they were put into use. The contracting company was allowed to work the plant for some months, but the results were so unsatisfactory that the whole apparatus at the stations where it had been used was discarded.

The General Manager has a paragraph concerning the matter of getting young men of a certain preliminary education for the railroad staff. The Civil Service Commission was requested to hold periodical examinations of candidates desiring to enter the lower ranks of the service. That commission, however, did not think it desirable to burden itself with this extra duty. A notice has been issued, therefore, that any candidate who has passed the school higher examination will have the preference, and that if there are not enough such candidates others will have to pass the railroad examination instituted for the purpose. There is some difficulty in getting a sufficient number of qualified young men to enter the lists, and probably for some time to come it will be necessary to continue to import trained railroad men. All employees, including day laborers, have the right to become a part of the "fixed establishment" after 10 years of approved service, and great eagerness exists on the part of the men to avail themselves of this privilege, which insures fixed tenure, pensions and other advantages. A committee of the House of Assembly has reported, however, that this system hampers the service to some extent and unduly increases the liabilities to the State, and that there is no other Government railroad company that deals so generously with its employees. It seems possible, therefore, that this system will be changed.

The Engineer-in-Chief reports that it is impracticable to form any estimate of the extent of the damage done to the bridges and culverts by the enemy and by military operations. Several large bridges have been destroyed or rendered useless, including those over the Vaal at Fourteen Streams, the Modder River bridge, that at Achtertang and one over the Oorlog's River. A number of smaller bridges and many culverts have been destroyed. To one looking at the matter from this distance it seems as if the Boers had not profited by their opportunities to destroy the railroads. We venture to say that Americans under similar conditions would have made it impossible to restore the railroads to working order for many months. At least this is precisely what they did on much shorter and less exposed lines during our Civil War. The comparatively little interruption of railroad service behind the armies indicates less energy and enterprise on the part of the Boers than they are usually credited with or efficient protection on the part of the British.

A special despatch to the *New York Times* says:

Early in June about every General Passenger Agent in Boston, New York, Chicago and all the large cities of this continent received a typewritten letter purporting to be written by Fred Harrison, general manager of the London

& North Western Railroad. The letter ran as follows: "Next month our Solicitor General of the legal department of this company will sail for America on a general tour of investigation and observation. His tour will carry him over the line of your road. If you will kindly send him trip transportation from —— to —— and return, good for three months, I shall appreciate your courtesy, and this company will reciprocate for the favor at any time on request." A postscript to the letter asked that the passes be sent to the Astor House, New York, addressed to the alleged Solicitor General. The result was that over 100 of the requests were honored. . . . It is estimated that transportation for not less than 50,000 miles was obtained. Most of the passes soon found their way into the hands of scalpers.

There are at least five reasons why any officer of an American railroad receiving this letter should have been suspicious. First, The London & North Western has a General Agent in New York through whom all business of this nature is passed. This fact is well known to the officers of the principal American roads. Second, Mr. Harrison signs himself F. or Frederick. Third, A letter from Mr. Harrison's office would not have said "*Our* Solicitor General of *the* land department," nor would it have said "reciprocate *for*." Fourth, The London & North Western has no such bombastic title as solicitor general. We find in the list a solicitor, but not even a general solicitor. Fifth, The expression "trip transportation" is not used in England. Mr. Harrison would not have said "pass." Finally, a letter so slovenly and affected could not have come out of the office of the General Manager of an English railroad.

We ask especial attention to the notice in another column of a vacancy in the Master Mechanics' Association scholarships at Stevens Institute. There is one vacancy and no applicant presented himself for examination in June. Examinations will be held in September, and another opportunity is offered. We should suppose that there would be no end of boys anxious to avail themselves of this chance to get a grand education, and that the competition for such a place would be great if its existence were generally known to railroad men. Particulars may be had by addressing the Secretary of the association.

NEW PUBLICATIONS.

The Nerve of Foley and Other Railroad Stories. By Frank H. Spearman. Octavo, 236 pages, illustrated. New York and London: Harper & Bros., 1900.

Mr. Spearman's volume contains 10 stories about railroads and railroad men with four illustrations which will be recognized by the instructed as conventionalized symbols standing for locomotives, cars and the like. The stories do very well as stories of this kind go. We have the strikes, the imperiled "kids," the small, blue-eyed, calm engine drivers with superhuman cheek, not to say courage. We have the usual ingenuity in inventing stories and the accustomed efforts at local color. These latter involve the plentiful introduction of throttle valves, air-brakes, injectors, etc., which are sometimes introduced in the right place and sometimes in the wrong place. We learn, for instance, that "scrambling to my feet I saw the new man clutching the air lever with both hands and every wheel on the train was screeching." Shortly after this happened it appears that "from the monstrous quivering leaps of the great engine I knew the drivers were in the clutch of the mighty air-brake." An instant later, however, "the little man at the throttle throwing the last ounce of air on the burning wheels leaped from his box with a face transfigured." Of course we all know what he was going to do. He went out along the running-board, and so down on the steam chest and caught a small boy by the slack of his breeches and landed him safely somewhere on the locomotive just as that small boy and an incidental horse and buggy were about to be demolished. In the course of this remarkable enterprise "the long heavy train flew round the bluffs like the tail of a very capricious kite, yet somehow—and that is the engineer's magic—she always lit on the steel." It is not necessary to carry further our inquiry into the nerve of Foley. It will be apparent at a glance to the initiated reader that the railroad man can get several kinds of amusement out of these stories.

Report Upon New York's Water Supply; With Particular Reference to the Need of Procuring Additional Sources and Their Probable Cost. Made to Bird S. Coler, Comptroller, by John R. Freeman, C. E.

In August, 1899, the Comptroller of the City of New York requested Mr. Freeman to make certain investigations and report to him upon certain subjects. He was requested to direct his attention particularly to the capacity and adequacy of the present sources of water supply; water waste and its prevention; pressure and volume with reference to fire protection; the best means of adding to the present water resources, and finally, the advantages and disadvantages of the additional supply from Esopus Creek proposed by the Ramapo Company. Mr. Freeman went at his task with prodigious energy, and, March 23, made a report to the Comptroller. It is now published, with notes added while the proofs were corrected. The document is a large octavo of 587 pages, with numerous diagrams and other illustrations, and it does not seem extravagant to say that it is an original, a valuable and a permanent addition to water supply literature.

Mr. Freeman found that in order to determine the actual yield of the Croton watershed he must begin at the beginning, recompute the quantities reported for many years past, and make original gagings. This study is reported in 140 pages, the upshot of it being that the measurements heretofore published and accepted as a basis for estimates of the daily amount of water that New York City can derive from the Croton watershed building more storage reservoirs averaged about 10 per cent. too great, or 38 million gallons per day.

He then proceeded to investigate the actual consumption and waste. This was, as everybody knows who knows anything about the subject, a difficult investigation, and in the end the conclusion must be only a more or less close guess. Mr. Freeman decides that the total uniform rate of delivery by the Croton aqueduct is 115 gallons per inhabitant per day. Of this the amount really used is probably 40 gallons. The incurable waste is probably 10 gallons, and the needless, or curable waste 65 gallons. He does not indulge in any illusions, however, as to the possibility of increasing New York's water supply by saving the waste. Indeed, he says, that the hope of restricting waste does not justify delay. Human nature being what it is and political and social conditions being as they are, it is too much to believe that the domestic supply in New York at large can be metered for a good while to come. It is believed that the present sources of supply will be ample for five years with the additional storage which will soon be provided.

In examining the sources of additional possible supply he finds that the price proposed by the Ramapo Company is exorbitant and that the source controlled by that company is less desirable, is of smaller capacity and its development more expensive than other sources that can probably be obtained. Other possible sources were examined quite thoroughly and the cost of developing them and of maintaining and administering them is given in much detail. It is not within the scope of this journal to make an elaborate review of a book of this character; but we call the attention of engineers to it, not alone for the information in it, but also as an example of thorough and systematic investigation.

TRADE CATALOGUES.

Car Couplers.—The McConway & Torley Co. have issued a special catalogue, prepared for the International Exposition, which is printed in English, French, German and Russian, and shows the product of that concern in considerable detail. A map of the United States accompanies the book, on which are shown in red lines those railroads which report to the Interstate Commerce Commission as using the Janney coupler, and, as the reader will well understand, the map is pretty well covered with red. We are informed that the Janney coupler is in service on upwards of 450,000 freight cars in the United States and other countries. The various passenger gears covering couplers, buffers, platforms and vestibules, as supplied by this concern, are shown by excellent engravings, as are also the various applications of the Janney coupler to freight cars and to locomotive tenders. Some entirely novel drawings show arrangements for attaching the Janney coupler to European rolling stock. The method is to substitute two automatic couplings for the two side buffers now in common use. These couplings are connected to the draft and buffing mechanism in such a way as to act both as couplings and buffers without interference with the present center hook coupling. The two couplers are connected by an equalizer, and, furthermore, the heads are pivoted on the stems, allowing lateral movement, and making it practicable to couple on curves.

Concrete Mixers.—Messrs. Ransome, Smith & Co., 17-19 Ninth street, Brooklyn, N. Y., send us a new circular showing and describing Ransome's patent concrete mixers. The drum mixer is shown mounted on a four-wheeled truck for convenient movement. This is a rotary barrel, fed through an opening in the center of one of its heads. The material, after being mixed, is automatically discharged through an opening in the other head. The portability of this mixer adapts it for railroad work and in general for work where it is required that the material shall be well mixed and where a comparatively small amount is to be used at one place. This mixer is entirely self-contained and can be at work within five minutes after its arrival at the place where it is to be used, provided the motor is on the same truck.

The continuous mixer is adapted for turning out large quantities of concrete with great speed. It is automatic and takes its material direct from cars, carts, etc., and measures and mixes them automatically; one man attends it. There is no limit to the capacity of machines of this type. A number of testimonials from engineers and contractors are included in the pamphlet.

Handbook of Injectors.—Messrs. William Sellers & Co., of Philadelphia, Pa., have issued a small, substantially bound, volume entitled "Handbook of Injectors and the Improved Self-Acting Injector." This is designed especially for locomotive engineers, and to be distributed gratuitously; therefore, copies can be procured on application. The preface tells us that "it is not an advertisement, nor does it tell everything about injectors, but it does contain some practical information which is intended to be useful as well as interesting." The intention of the writer has been realized. He has given useful and interesting information. There is a short but clear and simple explanation of the theory of the injector. This is followed by a description of the self-acting injector, directions to determine the size of an injector for a locomotive, a list of capacities and range instructions for setting the injector, connecting and repairing and using it, also descriptions and sectional views of parts, tables of tests and other useful information.

Steel Castings.—The American Steel Foundry Co., St. Louis, Mo., has issued a new catalogue of basic steel castings for locomotives and cars. There are illustrated various designs of diamond frame trucks with cast steel bolsters and with the spring seats and column guides cast together, these trucks having different arrangements of springs for freight cars and tender. There are also designs shown of electric car truck frames, cast steel truck and body bolsters, cast steel draft beams, couplers, and locomotive frames and driving wheel centers. Among miscellaneous steel castings may be mentioned driving boxes, rocker arms, center plates, draft rigging parts, rail steps, guard rail clamps, gears and similar pieces. The "American" pneumatic railroad ditcher is also illustrated.

TECHNICAL.

Manufacturing and Business.

The Arkansas Midland at Helena, Ark., wants a second-hand iron turn-table, 56 ft. long.

The Southern Iron & Equipment Co., Atlanta, Ga., has recently sold to the Jacksonville & Southwestern nine locomotives, and to the Tifton, Thomasville & Gulf four locomotives.

The war disturbances on the Manchurian Railway have not prevented American manufacturers from making heavy shipments to Vladivostock. The Thornton N. Motley Co. have lately sent to the Chinese Eastern Railway large shipments of boilers, engines, pumps, wrought iron pipe, jacks and wrenches, etc.

Among the novel American exhibits at Paris is a pavilion erected by the Standard Paint Co. of New York. After the French architects had made use of P & B ruberoid in the hallways and on the stairways of the chief executive building of the exposition commissioners for more than a year before the Exposition opened, it was arranged than an ornamental pavilion, to be constructed inside and out, flooring, sides, ceiling and roof, of ruberoid, should be built for the use of French authorities in the Colonial section. Thus, a building purely American in material is being used during the Exposition by the French Government. It is classified in the section of architecture. The ruberoid covering the exterior walls is decorated in imitation of gray birch with pilasters in oak. Though ruberoid was in service as a decorated flooring at the recent Brussels, Sydney and other expositions, the Paris decorations are of a higher artistic grade than has heretofore been attempted. In the American section (Machinery and Electricity Department) the P & B electrical compounds, insulating varnish and tape are shown; in the Civil Engineering and Transportation Department are the P & B insulating papers, roofing and other products of the Standard Paint Co.

Iron and Steel.

The Union Switch & Signal Co. has a contract to supply special frogs and switches for the Cape Government Ry.

At a recent meeting of the directors of the Carnegie Co. it was decided that a mill be built to make rods, bands and hoops.

The Bethlehem Steel Co. has the contract from the Russian Government for 2,000 tons of Krupp armor for three new Russian vessels, Alexander III., Orobino and Orel.

Presidents and managers of the leading iron and steel plants have been in consultation in Chicago concerning the general situation of the market, and to consider closing the mills.

The *Journal of Commerce* says it is expected that some substantial orders will be placed during the early part of August for rails, pipe, plates, sheet iron, boiler tubes, etc., for the South American market, particularly Argentine and Chili.

The first shipment of steel billets and ingots from the Southern iron field to Europe was made by the Tennessee Coal, Iron & Railroad Co., July 29, for Glasgow, Scotland and Copenhagen, Denmark. Thirty tons of billets go to the first place and a similar amount of ingots to the latter.

E. A. Yerkes, of the firm of Anderson, DuPuy & Co., of McKees Rocks, died at his home in Crafton, Pa., July 21, at the age of 57. Mr. Yerkes was the inventor of several patents to make hammers, sledges and edged tools. He was a member of the firm of Yerkes & Plumb, of Philadelphia, tool makers.

The British Commercial Agent at St. Petersburg, Russia, informs his government that, according to Siberian newspapers, a Philadelphia firm is in communication with the Russian Government with the object of building a locomotive works along the Siberian Railroad. A rail-making plant is also reported proposed.

The contracts for supplying steel projectiles, for which bids were recently advertised by the Army Ordnance Department, have been awarded as follows: Six-in. shot and shell and 12-in. torpedo shell, to the Taylor Iron & Steel Co. of New Jersey; 10-in. and 12-in armor-piercing projectiles and 12-in. deck-piercing projectiles, to the Midvale Steel Co. of Pennsylvania.

Signaling at the Paris Exhibition.

The *Revue Generale des Chemins de Fer* for June contains a very elaborate article, 100 pages in length, on the railroad and tramway arrangements for the World's Fair. This is devoted almost entirely to the subject of interlocking and signaling. It is impracticable for us to make an abstract of an article so long and so detailed that would be of much use to the reader. We mention the article, however, in order that those who read French, and who are especially interested, may procure this number of the *Revue*. The same number contains also a description of the signals used on the Belgian State Railroads.

Medal for the Continuous Rail Joint.

The Jury of Awards of the World's Paris Exposition have given the highest award, a bronze medal, to the Continuous Rail Joint Co. of America, Newark, N. J., for the various types of rail joints applied to the tee and girder rail sections. This is the only medal awarded in the rail joint exhibit.

Lubrication of American Locomotives.

In the June number of the *Revue Generale des Chemins de Fer* Mr. Oudet, Inspector of Material for the French State Railroads, has an article on the lubrication of American locomotives. At the outset he says: "In the United States the quantity of oil used in lubricating locomotives is generally small compared with the quantity used in France. Must this be attributed to the quality of the oil employed, or must we attribute it to the kind of apparatus used for lubrication which facilitates access to all parts of the machine, and which permits the enginemen to give more efficient attention to lubrication? This question appears difficult to decide clearly, but it is certain that the lubricating apparatus on American engines permits a more regular distribution of the oil, and by reason of the facility of inspection, etc., leads to better care in this detail. In what follows we shall review the apparatus and methods of lubricating axle boxes, valve motion and cylinders." He then proceeds to show by numerous engravings and to describe the lubricating devices in common use on American railroads.

Locomotive Rating.

In the article "Locomotive Rating on the Mexican Central," in our issue of June 15, the statement that a reduction of 10 per cent. is made from the combined rating of the two locomotives when a pusher is used, but that that no reduction is made with double headers, should have been reversed. It should read that a reduction of 10 per cent. is made with double headers, but with a pusher the total combined rating of the two engines is taken.

Brake Shoe Tests.

At the last convention of the Master Car Builders' Association the Standing Committee on Tests of Brake-Shoes was instructed to test such brake-shoes which have made sufficient departure from those previously tested to affect their efficiency or durability, as should be presented to it by railroad companies members of the Association. The committee will make tests of brake shoes during the month of March, 1901, and if it is the desire of any of the railroads represented in the Association to have brake-shoes tested, they should communicate with the Chairman of the committee as early as possible, so that arrangements can be made for the tests. Address S. P. Bush, Superintendent M. P., C., M. & St. P. Ry., West Milwaukee, Wis.

Passenger Car Ventilation.

According to the *Pittsburgh News*, a passenger car is now running on the Pittsburgh & Lake Erie with ventilating windows. According to the description the window opening, when the sash is raised, is filled with a deflector, made of glass, which is like a common wooden blind, with fixed slats, except that it is transparent. The slats are 2 in. wide, set at the usual angle, and overlap one another about one-half inch. The air, in entering, has to flow upward, and it is expected that most of the cinders will be dropped on the outside; but there is an inside wire screen to stop any particles which may have passed through the openings between the glass slats. The promoter of this device admits that it will not particularly improve the passenger's view of the scenery, but, on the other hand, he claims that the landscape is not "entirely marred."

The Crucible Steel Co. of America.

The following officers were elected at a meeting in Pittsburgh, July 25: Chairman, William G. Park; President and General Manager, Charles H. Halcomb; First Vice-President, James W. Brown; Second Vice-President, Benjamin Atha; Third Vice-President, Robert E. Jennings; Secretary, Frank B. Smith; Treasurer, Reuben Miller. The names of the Directors were given July 20, on page 498. Executive Committee—William G. Park, Charles H. Halcomb, James W. Brown, Benjamin Atha, Robert E. Jennings, Reuben Miller, Herbert Dupuy. Headquarters will be in Pittsburgh.

Snow Plows.

In our issue of July 20, page 498, we printed some extracts from a letter from Mr. J. W. Russell concerning the Wilder snow plows, of which a short description appeared in these columns recently. Mr. Russell said that Mr. Wilder's plan for making a double-end plow is part of an invention claimed by the Russell Snow Plow Co., and also that Mr. Wilder's proposed arrangement of mould board is covered by patents owned by the Russell Co. Other statements were made which we need not repeat now. We now have a letter from Mr. Wilder, who says that the device used by him, permitting a plow to be used either end first, "was invented by me at my home, and, when explained to Mr. Russell, was acknowledged at the time as being entirely new to him." He says a number of other things that bear upon the subject, but this is the essential statement. It is only fair to Mr. Wilder that we should print his denial of Mr. Russell's claim, but here the controversy must cease, so far as our columns are concerned. It would be obviously improper for us to permit the case to be tried in the *Railroad Gazette*.

The King Bridge Co.

The following letter explains itself. It is signed by the King Bridge Co.:

In answer to numerous inquiries from our patrons and friends, we feel, in justice to ourselves, that we should state that we have not, nor do we at present contemplate disposing in any way of our bridge and structural works to any trust or combination of bridge companies formed for the purpose of restricting or controlling the manufacture and sale of bridges or structural materials.

We expect to continue to operate our business under our own management and direction as we have for the past forty-five years, making at once such extensions to our plant and machinery as will increase our output about double what it has been.

These facilities, together with special advantageous arrangements for procuring materials promptly, will enable us to sell bridges and structural work at a minimum cost and time of delivery to our patrons, the list of whom we hope to increase, feeling confident that they will desire the fullest competition and find it an advantage to deal directly with us rather than with the various departments of a trust.

THE SCRAP HEAP.

Notes.

The Rutland Railroad is introducing electric headlights on some of its locomotives and is going to adopt the duplicate system of train orders.

The Chicago & Alton is putting oil on its roadbed to lay the dust, being the first company in the West which has made this experiment. About 75 miles of the line will be treated.

It is said that the pension regulations of the Pennsylvania Railroad will be extended to include the employees of the Western New York & Pennsylvania and the Allegheny Valley, which roads are now operated as a part of the Pennsylvania Railroad System.

The Albany *Journal* reports that in consequence of the law requiring automatic couplings and air-brakes on all freight trains, which is now in effect, the Delaware & Hudson will take off one man from each freight train crew, having two brakemen instead of three.

The New York Central has made an advance of 10 cents a day in the pay of firemen on freight trains on the Beech Creek Division, and has granted the requests of the enginemen and firemen on the main line for certain other changes in pay or rules. According to the statement of one of the Brotherhood men there has also been an increase in the pay of enginemen who have been serving as such not more than one or two years.

The passenger station of the Fitchburg Railroad in Boston, the well-known granite structure, with turrets, which has been a landmark for many years, is to be used by the Boston & Maine for offices. The auditor of passenger accounts, who employs about 200 clerks, will occupy the larger part of the building. The officers of the operating department of the Fitchburg road, which is now a division of the Boston & Maine, will move from the old station to rooms in the Union (Boston & Maine) terminal station.

The Colorado Midland, which has spent about eight months' time and several thousand dollars in money in securing the punishment of one of the ticket scalpers who counterfeited excursion tickets issued by the road in September, 1899, has issued a pamphlet giving a brief history of the case. The culprit who was caught, William H. Blase, appears to have been one of the toughest characters of his class. He was sentenced at New York on June 26 to two and a half years' imprisonment. The Colorado Midland never accepted more than $24 worth of the spurious tickets, so that its efforts toward punishing the counterfeiters are to be looked upon as in the nature of a public service.

The coroner's jury which investigated the street car disaster which occurred at Tacoma July 4 has rendered a verdict declaring that the derailment was due to running at too high speed; that the motorman was grossly careless; that the company was grossly and criminally negligent in sending out a motorman whose skill in handling cars on steep grades had not been tested, and that the company was equally culpable for not having put in safety appliances after an accident to a freight train which occurred at the same point. It is further found that a general laxity prevails in the maintenance of the track and equipment. The Tacoma *News* says that the fatal trip was the first one that this motorman had ever made over that line in charge of a car.

The main central hall of the Union passenger station at St. Louis, one of the finest rooms of the kind in the country, is going to be altered, experience having shown that passengers do not use it. The large room beneath it, which is nearer the street level and the train platform level, and which contains the ticket offices, is used by the great majority of passengers of all classes, and the main floor is nearly always practically empty. An opening is to be made in the floor, in the center of the room, and a handsome balustrade put in; so that the ceiling of the main hall will become the ceiling of the lower hall, and the main floor, what is left of it, will become a gallery.

Traffic Notes.

The conference of State Railroad Commissioners, which is to be held on the invitation of the Commissioners of Mississippi, will take place at Lookout Mountain August 29.

The Western roads are now running their usual summer excursions to Niagara Falls. On the 26th the Big Four took over 4,000 passengers out of Indianapolis for the Falls.

Tourist travel to Colorado has been heavy throughout July, and during the last week or two passenger trains of 12 or 15 cars have been common on the principal roads running from the Missouri River.

The action of the Southern Pacific in offering reduced rates to merchants in Texas desiring to visit New York has led the Southwestern Passenger Association to grant these merchants a round trip rate of a fare and a third.

After two or three weeks of fair maintenance of rates—fair according to the newspapers—it is reported that eastbound rates from Chicago are now being shaded considerably. This report refers chiefly to provisions, the movement of grain by rail being small at present.

Excursion tickets from points in the West to Atlantic City will this year contain a clause requiring the passenger to go direct to destination, and to deposit his ticket with the agent there on arrival, so that the return as well as the going journey can be made on dates fixed by the railroads, thus preventing the use of the tickets by passengers going to other cities.

A summary of the work of the inspection bureaus of the Central Freight Association for a year has been published in a Western paper. Inspection is maintained at 55 different cities or freight stations, and the amount saved in 12 months by the corrections of weight and classification which have been made by the inspectors, amounts to $1,955,986. The expenses of the bureaus amounted to $187,165, leaving net gains of $1,768,821. The increases made in weights amounted to over 708,000 tons, and the changes in classification added to bil's $435,518. Collections at Chicago netted about $280,000; at Bay City, $228,000; at Cincinnati, $156,000.

Railroad Material for Argentina.

The Argentine Government will shortly build a light railroad in the south about 1,000 kilometers long. This is to be built with the material obtained in place of the guns and other war material ordered when the relations with Chile were strained. Engineers will shortly leave to make surveys which will require about five months. Letters should be addressed to Ministro de Obras Publicas, Buenos Ayres.

Street Cars in Washington.

We mentioned lately the consolidation of the street railroad companies in the District of Columbia and the improvements in the service. A correspondent from Washington writes saying that some very long and wide double-truck, open electric cars have been put into the city and suburban service. These seat 84 persons, and many more can stand, but even with the extra width between tracks these long and wide cars cause delay at curves, and the question of proper brake power does not appear to have had sufficient attention. Not many of these very large cars are yet in use. They run over the main line in the city and out to Glen Echo, several miles up the river. "The service given by the street railroads here is the best I have seen anywhere."

The Recalescent Point.

The determination of the recalescent point of nickel steel has been male by Messrs. H. Souther and F. S. Flavel, for the Pope Manufacturing Co. It appears that the recalescent point of 0.25 carbon steel is a little over 1,600 degrees Fahr., while that of 0.50 carbon steel is between 1,350 degrees and 1,400 degrees, and that of 5 per cent. nickel steel, with 0.25 carbon, is about 1,080 degrees Fahr. The recalescent point of pure nickel is 1,112 degrees Fahr. This furnishes an explanation of the super-sensitiveness of nickel steel to heat treatment. The proper annealing temperature for the simple carbon steel is, according to Mr. Souther, a full red, while for nickel steel the heat should not be over a "cherry" red.—*Sparks*.

The Stevens Institute Scholarship.

There now exists at the Stevens Institute of Technology, Hoboken, N. J., one vacancy in the four scholarships which the American Railway Master Mechanics' Association has endowed at that institute. At the examination held the first week in June, 1900, there were no applicants for this vacant scholarship, and, in accordance with the provisions of the constitution of the association, applications will now be received from other railroad employees or the sons of other railroad employees for the examination, which will be held September 16, 17, 18, 19 and 20, 1900. Candidates for examination for this scholarship should apply to Mr. Joseph W. Taylor, Secretary, The Rookery, Chicago, and, if eligible, will be given a certificate which will entitle the candidate to attend the preliminary examinations. If more than one candidate passes these examinations, the applicant passing the highest examination shall be entitled to the scholarship, the school authorities settling the question. Preference will be given to the employees or the sons of employees or the sons of deceased employees of the mechanical departments. The successful candidate shall be required to take the course of mechanical engineering.

New South Wales Electric Railroad Supplies.

Mr. Charles Oliver, Chief Railroad Commissioner of New South Wales Government Railways, is in New York, with headquarters at the offices of Messrs. R. W. Cameron & Co., 23 South William street. He is about to place orders for machinery, etc., for the Sydney City & Suburban Tramways. Owing to the increased traffic on the road it will be necessary to install three 1,500 k. w. generators. At present the railroad is using horizontal engines, built by the Edw. P. Allis Co. The new engines to be bought will be vertical. The contracts to be placed will total nearly $850,000. It is expected that by the time the new system is in operation the capital invested in machinery, track material, etc., will not fall short of $3,500,000, nearly all to be spent in America. Only the car bodies will be built at home. The leading contracts, outside of those for the generating station, will be for trolley poles and wiring.

The Brooklyn Elevated Railroads.

Attention has been called, from time to time, during the past four or five years to the improvements made in

the track, rolling stock and traffic arrangements of the elevated railroads of Brooklyn, whereby a betterment of the service has been accomplished. In our issue for May 26, 1899, we published a map of the whole system of surface and elevated roads at that time controlled by the Brooklyn Rapid Transit Co. With the adoption of electricity as a motive power, further improvements have been made. The latest of these is a loop connecting the Fulton street and Broadway lines at East New York. This loop is a short curve filleting the acute angle between the two lines and making it possible to run trains from the bridge to East New York and back with no delays other than station stops. The route is out Fulton street to East New York, turning into Broadway over the new loop, thence to Lexington avenue, to Grand, to Myrtle, to Adams street and the bridge. Owing to the scarcity of rolling stock the trains will only run over this route, for the present, during those hours of the day when there is no rush. During the rush hours of the morning and afternoon the loop will not be used.

Fast Time With an Accommodation.

According to the Harrisburg *Patriot*, Train No. 13, of the Pennsylvania Railroad, on July 26, made the run from Harrisburg to Altoona, 132 miles, at the rate of 41.9 miles an hour, including 33 stops. The train left Harrisburg 43 minutes behind, and reached Altoona five minutes ahead of time. The train was made up of postal cars, a combination car and three passenger coaches. It was hauled by engine 492, and was in charge of Engineer William Kurtz and Conductor J. S. Wagner. From Bailey's to Newport, a distance of five miles, the running time was four minutes.

Third Rail for the B. & O. Tunnel.

Work on the third rail which the Baltimore & Ohio is installing in the Belt Line tunnel to take the place of the overhead system, is being carried ahead. When it is finished electric motors will be more extensively used in hauling trains through the tunnel.

Locomotive Building in Italy.

Advices from Milan are to the effect that two of the largest locomotive and car-building firms in Italy are to combine. They are Miani, Silvestri & Co. and Grondona, Comi & Co., both of Milan. The combination will increase the capital of the new concern, the title of which has not yet been decided upon. The object is to increase the capacity of the works. The erection of new shops will involve heavy expenditures for machinery and tools.

Motors for the New York Central Tunnel.

A daily newspaper report which seems reasonable and authentic says: "Much that is not so has been printed recently relative to the efforts of the New York Central to eliminate the smoke and steam from the tunnel between the Grand Central Station and Mott Haven. The New York Central people have been examining and testing electrical and compressed air motors for the last three years. Nothing of practical value to this railroad company has been found, consequently recent reports that a certain electrical motor had been practically adopted are erroneous. Superintendent Van Etten says that he has yet to see the electrical motor that can be relied upon to perform such switching service as the New York Central requires at its New York city terminal. Two facts are established. One is, that changes of motors cannot be made between Mott Haven and the Grand Central Station; any attempt to change motors at Mott Haven or even further up the line would result in a serious blockade. The second fact is that no electrical or compressed air motors have been made yet that can haul a train far enough to be effective on the New York Central. Means of storing sufficient power in a motor for a run of 100 miles or more must be discovered before the New York Central managers will feel justified in making any changes."

The Elbe-Trave Canal.

Consul Hill writes to the State Department from Amsterdam: The new Elbe and Trave Canal, which has been building five years, and has been completed at a cost of $5,831,000, was formally opened by the German Emperor on the 16th inst. The length of the new canal—which is the second to join the North Sea and the Baltic, following the Kaiser Wilhelm Ship Canal, or Kiel Canal, which was finished five years ago at a cost of $37,128,000—is about 41 miles. The available breadth of the new canal is 72 ft; breadth of the lock gates, 46 ft.; length of the locks, 87 yds.; depth of the locks, 8 ft. 2 in. The canal is crossed by 29 bridges, erected at a cost of $1,000,000. The span of the bridges is in all cases not less than 30 yds., and their height above water level about 15 ft. There are seven locks, five being between Lubeck and the Mollner See—the highest point of the canal—and two between Mollner See and the Lauenburg-on-the-Elbe.

LOCOMOTIVE BUILDING.

The Boston & Albany is having five engines built by the Schenectady Locomotive Works.

The Southern Pacific is having 10 engines built by the Cooke Locomotive & Machine Works.

The Nashville, Chattanooga & St. Louis is having 10 engines built by the Baldwin Locomotive Works.

The Intercolonial of Canada, it is reported, has ordered 10 engines from the Richmond Locomotive & Machine Works.

The New York Central & Hudson River, we are officially informed, has not ordered new locomotives, as has been reported.

The Finland State Railways have placed an order with the Richmond Locomotive & Machine Works for 12 16 in. x 24 in. 10-wheel passenger engines. This is the third order for engines received by the Richmond Works from the Finland State Railways.

The Atchison, Topeka & Santa Fe, as noted last week, has ordered 20 10-wheel freight locomotives from the International Power Co., for fall delivery. These locomotives will have 20x28-in. cylinders, 60-in. drivers, 200-lbs. working steam pressure and a total weight in working order of 163,000 lbs., of which 130,000 lbs. will be on the drivers. They will have the extended wagon top boilers with 281 Tyler charcoal iron tubes, 14 ft. 6 in. long and 2 in. in diameter, and steel fireboxes. The tender capacity will be 5,000 gallons of water. The special equipment includes American air-brakes, "Diamond S." brake-shoes, M. C. B. couplers, Simplex injectors, Jerome piston rod packings, National springs, Latrobe tires on driving wheels and Standard tires on truck and tender wheels; main wheel center will be of cast steel and front and back cast iron. Peerless babbitt metal and Ulster special stay bolt iron will be used.

CAR BUILDING.

The Pullman Co. is building 10 cars for general service.

The New York, New Haven & Hartford is in the market for some passenger cars.

The Seaboard Air Line has placed an order with the South Baltimore Car Works for 2,000 cars.

The Chicago & Alton order with the Pressed Steel Car Co. is for 500, and not 800, cars, as noted last week.

The Chicago & Northwestern has ordered 15 flat cars and five box cars from the American Car & Foundry Co.

The Pennsylvania, it is reported, has ordered built at its Fort Wayne shops 100 dairy cars, 100 vegetable refrigerator cars, 200 gondola cars and 50 palace horse cars.

The American Car & Foundry Co. has received an order, for export to Cuba, for six flat cars. This company has also received orders for three tank and 25 poultry cars.

The Southern Pacific order for 2,000 cars placed with the American Car & Foundry Co., as noted in our issue of July 7, will be built from the designs of F. E. Canda, being the same as 1,600 box cars heretofore built for the same company.

The Union Pacific has placed an additional order with the Pressed Steel Car Co. for 300 box cars. The order placed by this company with the Pressed Steel Car Co., as noted in our issue last week, was incorrect, 300 flat cars only being ordered.

BRIDGE BUILDING.

Albany, N. Y.—The State Board of Railroad Commissioners will give a hearing August 15 to discontinue the D. & H. grade crossing at Bethlehem. The board has ordered the following crossings placed underneath the railroads: Southport, Chemung County; Fenton's crossing and Lakeside crossing in the town of Geddes, Onondaga County. The following crossings were ordered carried over the tracks by means of bridges: Overhead bridge road in Evans, Erie County, and Belle Isle, in Onondaga County.

The Albany & Hudson Railway & Power Co. has permission from the State Railroad Commission to build a bridge over the New York Central & Hudson River R. R. tracks near Rensselaer.

Bids are wanted by the Superintendent of Public Works at Albany, N. Y., until 12 o'clock noon of August 7, for the following work:

For a steel bridge of three spans over the Cayuga and Seneca Canal near Rumsey street in Seneca Falls.

For a steel Warren-truss bridge of 85-ft. span over the Erie Canal at South George street, Rome.

For a steel bridge of two 65-ft. spans over Clear Creek on the Cattaraugus Indian Reservation, Erie County.

For four steel farm bridges over the Erie Canal, respectively, 1½ miles west of Eagle Harbor; 1½ miles west of Middleport; 4 miles west of Gasport, and at Cady street in the city of Lockport.

Plans, specifications, etc., can be obtained at the office of the Superintendent of Public Works, Albany; at the office of Thomas Wheeler, Assistant Superintendent of Public Works, Syracuse, and at the offices of Houston Barnard, Assistant Superintendent of Public Works, Rochester and Buffalo, N. Y. John N. Partridge, Superintendent of Public Works.

Baltimore, Md.—The Baltimore and the Howard County Commissioners will confer on August 16 regarding a proposed bridge over Patapsco River.

Bayonne, N. J.—The Central Railroad of New Jersey will soon begin the work of raising its tracks through Bayonne. A bridge will be built at Thirtieth street.

Boston, Mass.—The bids for eight masonry piers for the new bridge between Boston and Cambridge were: Jones & Meehan, $479,600; O'Brien, Sheehan, Perkins & McHale, $466,136; Alexander McGaw & Sons, $657,800; Nawn & Brock, $597,000; National Contracting Co., $627,000; William J. Lawlor, $513,000; Charles T. Berry & Co., $633,777; Holbrook, Cabot & Daly, $460,000; Miller & Ellis, $466,749; Metropolitan Contracting Co., $614,344; Ross & Fowler, $495,000. The contract was let to Holbrook, Cabot & Daly.

Buffalo, N. Y.—City Engineer F. E. Bardol is reported to have received from the New York Central plans for the elimination of seven grade crossings, the most important being Main street, Amherst street and Delavan avenue. Estimated cost, $1,200,000.

Permission is granted the South Buffalo R. R., the new road to the steel plant, to build bridges to cross the Hamburg Turnpike in the towns of West Seneca and Hamburg. The State Railroad Commissioners will decide the kind of bridges to be built.

The Aldermanic Committee on Bridges has reported in favor of letting the contract for the superstructure of the Seneca street bridge to the Buffalo Bridge & Iron Works at $19,950.

The Park Board received these bids for a bridge in Delaware Park: Rumrill & Carter, $44,900; Henry Schaefer's Sons, $50,734, and J. H. Tilden, $53,426.25. The contract is let to Rumrill & Carter.

Camden, N. J.—The time for receiving bids for a steel highway bridge over Cooper's Creek is changed to August 6. J. J. Albertson, County Engineer.

Centerville, Md.—The County Commissioners returned the unopened bids for the Island Creek bridge. New bids are wanted.

Cleveland, Ohio.—Bids are asked until August 15 for repairing the substructure of the Winslow street bridge. Walter P. Rice, Director Department of Public Works.

The County Commissioners opened five bids, $8,500 to $14,850, for the superstructure for the bridge over the river at Eight-Mile Lock.

Detroit, Mich.—The Michigan Central has offered to begin the work of raising its tracks at Woodward avenue to eliminate the grade crossings in the city from West Detroit to Milwaukee Junction.

Eureka, Cal.—The contract for the bridge over Van Duzen River, near Alton, for Humboldt County, is let to the San Francisco Bridge Co. at $25,890. The bids were: H. G. Cupples, steel bridge $27,565, combination bridge $23,400; W. J. Schmidt, steel bridge $28,900, combination bridge $20,900; Hyde Construction Co., steel bridge $27,900, combination bridge $21,000; San Francisco Bridge Co., steel bridge $25,890, combination bridge $18,333; K. Evans, steel bridge $26,800, combination bridge $18,400.

Jenkintown, Pa.—A county commission has reported favorably the project to build a bridge across the Philadelphia & Reading tracks at Jenkintown.

Jersey City, N. J.—The bids for the new Paterson Plank Road bridge, 1,400 ft. long, were: Owego Bridge Co., 30-ft. bridge $220,000, same bridge with trolley tracks $220,000, no bid for a 40-ft. bridge; Berlin Iron Bridge Co., 30-ft. bridge $192,500, with tracks $197,500, 40-ft. bridge $235,000; Whymkoff & Barclay Co., 30-ft. bridge $205,000, with tracks $207,000, 40-ft. bridge $243,000; Canton Bridge Co., 30-ft. bridge $215,000, with tracks $248,000, 40-ft. bridge $275,000; Joseph Cutley, 30-ft. bridge $203,600, with tracks $203,900, 40-ft. bridge $242,400; F. R. Long & Co., New York, three plans for a 30-ft. bridge: Plan A, $194,000; Plan B, $201,000; Plan C, $198,000. Cost of tracks to be added; $4,000 more to each proposal. Forty-ft. bridge, Plan A, $230,000; Plan B, $234,000. Whymkoff & Barclay Co. got the contract.

Leavenworth, Kan.—Reports state that the County Commissioners propose to build two bridges near Harvey's farm.

Montreal, Que.—The Grank Trunk Ry. has submitted plans to the Level Crossing Commission of the city for an overhead bridge at Mountain street, and for building subways at the crossings west of Mountain street.

New Castle, Va.—Bids are wanted August 15 at King William Courthouse, Va., for a bridge and approaches at New Castle, over the Pamunkey River, with a 40-ft. clear draw. Plans for both wood and steel draw invited. T. D. Moncure, Commissioner, Aylett, Va.

Newton, N. J.—The Sussex Board of Freeholders will repair the bridge over the Stynx River, in Bryan Township, at a cost of about $15,000. The bridge is over 600 ft. long.

Norfolk, Va.—At the meeting of the Local Board of Brambleton July 31 the question of building a bridge from the foot of Ferguson avenue to Wood street was considered.

North Adams, Mass.—Bids are wanted August 4 for the steel superstructure of the two plate girder bridges in Beaver street. J. L. Temple, Commissioner of Public Works.

Philadelphia, Pa.—The Commissioners of Fairmount Park ask of the City Council $767,970 for the park work next year. Of this $100,000 is for a new bridge across Lansdowne Glen to replace the one built in 1876.

Port Kennedy, Pa.—The Montgomery County Commissioners have decided to rebuild the bridge over the Schuylkill River at Port Kennedy at a cost of $40,000.

Rome, N. Y.—See Albany, N. Y.

Salinas, Cal.—A bridge is wanted across the Pajaro River at or near Vega, between Santa Cruz and Monterey counties.

San Andreas, Cal.—Bids are wanted Aug. 18 for a bridge across Angels' Creek. J. S. Jack, Clerk to the County Supervisors.

Seneca Falls, N. Y.—See Albany, N. Y.

Smethport, Pa.—Viewers have recommended an iron bridge about 100 ft. long over Kinzua Creek in Hamilton Township, near Newtown.

Spartanburg, S. C.—The Spartanburg & Clinton R. R., a proposed line in which John Gary Evans, of this place, is interested, will need two bridges, each about 200 ft. long.

Sullivan, Ind.—Bids for wrought iron or steel county bridges are wanted until August 10, according to report. George Goodwin, Chairman of the County Commissioners.

Tampa, Fla.—Reports state that the Hillsboro County Commissioners will let a contract about August 15 for a bridge over Alafia River.

Troy, N. Y.—The Stillwater & Mechanicsville Street R. R. has petitioned the State Railroad Commissioners to build a bridge over the Hudson River from a point near the Waterford & Whitehall Turnpike to a point opposite in the town of Lansingburg. A hearing will be given August 15.

Wilkesbarre, Pa.—Contracts were let July 24 for the concrete and iron bridges over the Wilkesbarre and Kingston Pond Holes and filling the approaches. A. H. Coon & Co., of Kingston, Pa., was awarded the contract for the Kingston Pond Hole bridge at an estimated cost of $13,000. Thomas & Watkins, of Plymouth, Pa., were awarded the contract for the Wilkesbarre Pond Hole bridge. Estimated cost, $23,000.

Wilmington, Del.—The War Department has been asked to have the center pier of the Market street bridge removed.

Worcester, Mass.—The Legislature has passed a bill authorizing the separation of the grades in this city.

Other Structures.

Binghamton, N. Y.—The Lackawanna has let a contract for its new passenger station in this city to the Grace & Hyde Co., 26 East Forty-second street, New York. The building will cost over $40,000.

The Erie is contemplating large improvements about its station here.

Braddock, Pa.—Furnace B of the Edgar Thomas blast furnaces of the Carnegie Co. will be torn down and rebuilt. The present capacity is 300 tons daily, which will be increased to 500.

Buffalo, N. Y.—Fire completely destroyed the new transfer house of the Lehigh Valley R. R. in Dingens street, East Buffalo, July 23, destroying 65 loaded freight cars, besides the merchandise in the freight, causing a loss of $150,000. The building was 600 ft. long and 70 ft. wide.

Camden, N. J.—Chief Engineer Brown, of the Pennsylvania, will receive bids in a few days for building a new bulkhead from the north side of Federal street to a point about 350 ft. further up the Delaware River. This is the first work in connection with plans for remodeling the railroad and ferry terminal at Camden. A new train shed about 600 ft. long will be built.

Mobile, Ala.—The Southern Ry. is reported receiving bids for a new coal hoist at Mobile.

New Orleans, La.—Work is begun on the new Government dry dock at Algiers, for which the Maryland Steel Co. has the contract. The total cost will be $810,-

000. The dry dock will be 535 ft. long, 132 ft. wide and 55 ft. deep, being the largest in the world. Beside the dock the Government will build machine shops at a cost of about $1,200,000.

PITCAIRN, PA.—The Pennsylvania R. R. is making some extensive improvements to the car shops at Pitcairn. The blacksmith shop is being extended by 30 ft., and 10 ft. is being added to the machine shop.

TCHULA, MISS.—It is announced that the new shops of the Yazoo & Mississippi Valley Division of the Illinois Central will be located at Tchula.

WAYNE JUNCTION, PA.—The Philadelphia & Reading is reported to have received bids for a new station at Wayne Junction. It is to be 600 ft. long and 40 ft. wide.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xi.

Society for the Promotion of Engineering Education.

The following officers were elected at the annual meeting: President, Prof. Frank Marvin, Lawrence University, Lawrence, Kan.; Secretary, Henry S. Jacoby, Cornell University, Ithaca, N. Y.; Treasurer, C. A. Waldo, Purdue University, Lafayette, Ind.

Northwest Railway Club.

At the meeting of the club held at Ryan Hotel in St. Paul May 15, Professor George D. Shepardson, of the University of Minnesota, read a paper on "Train Lighting," illustrated by stereoptican views. Mr. T. Lester Daniel, of the University of Minnesota, read a paper on "Some Notes on Train Resistance." The next meeting of the club will be held at West Hotel, Minneapolis, Minn., September 11.

American Institute of Electrical Engineers.

The following programme of functions at London and Paris is issued by Ralph W. Pope, Secretary: Members are to register at the Institution of Electrical Engineers, 28 Victoria street, Westminster, S. W., and send Continental address to R. W. Pope, care of McGraw Publishing Co., Palace of Electricity, Exposition, Paris. By courtesy of the Institution of Electrical Engineers the following programme has been arranged:

London. Sunday, August 12.—Trip up the Thames by rail to a convenient point, thence by electric launches, returning by same route after lunch. Monday, August 13.—Dinner in the evening. Monday and Tuesday—Visits will be arranged to works, etc., in the vicinity of London. Wednesday, August 15.—Special train to Paris.

Paris. Thursday, August 16.—Joint meeting by courtesy of Commissioner Peck in the U. S. Pavilion. Subject for discussion: "The Relative Advantages of Alternate and Continuous Currents for a General Supply of Electricity, Especially With Regard to Other Interests." The special point which the British Committee would like to have discussed is: How far will interference with other undertakings, rather than ordinary commercial and industrial conditions, be the factor which will determine whether continuous or alternating currents shall be employed?

PERSONAL.

(For Other personal mention see Elections and Appointments.)

—Mr. A. C. Wurtele, Secretary of the L'Epiphanie & L'Assomption Ry., died suddenly at his home in Montreal July 16, aged 63 years.

—Mr. John F. Woffindin, Chairman of the Chicago Freight Committee of the Central Freight Association, died suddenly at his home in Chicago on July 25. He was 63 years of age, and had been connected with the Freight Association for 15 years.

—Mr. James A. Garland, for many years Vice-President of the First National Bank of New York, and a Director of the Central Railroad of New Jersey, died July 26 at the home of his son, James A. Garland, Jr., at Hamilton, Mass. Mr. Garland was 61 years of age.

—Mr. W. B. Mallette, who resigned as Purchasing Agent of the Chicago Terminal Transfer in May last to accept the position of Mechanical Engineer and Assistant to the General Manager of the American Washer & Manufacturing Co., of Newark, N. J., and Chicago, was born in Springfield, Ill., in May, 1867. He began railroad work at 15 as office boy with the Superintendent of Motive Power of the Wabash, St. Louis & Pacific. He served with that company, the Jacksonville Southeastern, the Atchison, Topeka & Santa Fe and the Wisconsin Central in various capacities, when he was made Purchasing Agent of the Chicago Terminal Transfer, and held that position for nine years.

—Mr. Charles B. Price, whose appointment as Superintendent of the River Division of the Pennsylvania taking effect August 1, has been noted in these columns, was born in Philadelphia March 15, 1851. He entered railroad service on October 19, 1869, with the Oil Creek & Allegheny River, now a part of the Western New York & Pennsylvania. He served principally as rodman on construction until August, 1871, when he was appointed chief clerk to the Division Superintendent. In November, 1872, he was appointed to a similar position on the Allegheny Valley, and has since continued with that company. He was appointed Car Accountant June 1, 1880; Superintendent of the River Division June 1, 1881; Acting General Superintendent December 1, 1898, and General Superintendent July 24, 1899. Mr. Price is President of the American Society of Railroad Superintendents.

—Mr. L. W. Allibone, Superintendent of the Cambria & Clearfield Division of the Pennsylvania, was born April 2, 1857, at Philadelphia, Pa. He prepared for college in private schools and at Cheltenham Academy, and studied civil engineering in the John C. Green School of Science, Princeton University, as member of the class of 1879. The honorary degree of Civil Engineer was conferred upon him by Princeton University in 1893. He began railroad work on April 1, 1880, as a rodman in the construction and location of the Ohio & West Virginia, now part of the Hocking Valley. Six months later he entered the service of the Pennsylvania as rodman, with headquarters at Paoli, and has been with that company ever since. He served until April 7, 1882, on construction of third and fourth tracks on the New York Division; to October 14, 1882, in the office of the Principal Assistant Engineer in Altoona, Pa.; to May 12, 1883, as Assistant Supervisor on the Pittsburgh Division; to March 1, 1884, as Assistant Supervisor on the Delaware Division of the Philadelphia, Wilmington & Baltimore; to November 1, 1889, as Assistant Engineer of the same division, and to April 1, 1891, as Assistant Engineer of the New York Division. He was then promoted to Superintendent of the Bedford Division, which position he held at the time of his transfer on August 1.

ELECTIONS AND APPOINTMENTS.

Allegheny Valley (Pennsylvania).—Robert W. Smith, Treasurer of the Pennsylvania, was elected Treasurer of this company at a meeting of the directors held in Philadelphia July 24.

Atchison, Topeka & Santa Fe.—James Dun has been made Chief Engineer of the entire system, with headquarters at Topeka, Kan. W. B. Storey, Jr., Chief Engineer of the San Francisco & San Joaquin Valley Line, has been appointed Chief Engineer of the Atchison main line, with headquarters at Topeka. R. B. Burns, who is Chief Engineer of the Santa Fé Pacific and the Southern California divisions, has his jurisdiction extended over the San Francisco & San Joaquin Valley, with headquarters at Los Angeles, Cal. J. H. Banker, formerly Foreman of Bridges and Buildings and Water Service on the Middle Division, with headquarters at Newton, Kan., has been appointed General Foreman Bridges and Buildings and Water Service, with headquarters at Cleburne, Tex., succeeding E. McCann, promoted.

Austin & Northwestern (Southern Pacific).—The office of General Freight and Passenger Agent, held by L. S. Palfrey, has been abolished, and the duties are assumed by A. N. Leitnaker, General Manager.

Boston & Maine.—The following appointments have been made on the Fitchburg Division: F. O. Melcher, Superintendent, with office at Boston; M. F. Snyder, Assistant Superintendent of the Western Section, with office at Mechanicsville, N. Y.; E. A. Smith, Assistant Superintendent of the Eastern Division, with office at Boston; A. S. Cheever, Assistant to Chief Engineer, with office at Boston. These men held positions on the Fitchburg R. R. prior to the absorption.

Brainerd & Northern Minnesota.—M. W. Downie has been appointed Auditor, succeeding C. W. Schneider, resigned. The Accounting Department was removed from Minneapolis to Brainerd, Minn., on August 1.

Chattanooga Southern.—J. H. McGill is appointed Master Mechanic, with headquarters at Chattanooga, Tenn.

Chicago & Northwestern.—J. P. O'Brien has been made Assistant Superintendent of the Wisconsin Division, succeeding Fred R. Moulton, resigned. Mr. O'Brien is succeeded by Frank J. O'Brien, formerly Chief Train Dispatcher of the Peninsula Division.

Chicago & South Bend.—G. M. Sherman, First Assistant Traffic Manager, has been promoted to Traffic Manager, succeeding C. L. Millhouse, resigned.

Chicago Great Western.—Herbert T. Herr has been appointed Master Mechanic of the Kansas Division.

Denver & Rio Grande.—W. D. Lee, General Superintendent of the Rio Grande Southern at Ridgway, Colo., has been appointed Superintendent of the Second and Third divisions of the D. & R. G. at Salida, succeeding R. M. Ridgway.

Houston East & West Texas.—S. H. Dixon has been appointed Passenger and Immigration Agent at Houston, Tex.

Indiana, Illinois & Iowa.—The statement recently made in this column (July 20, p. 501) that F. M. Keys has been appointed Assistant Superintendent of Construction is an error.

Lehigh Valley.—Frank T. Sayer, General Car Agent of the Lehigh & Hudson, has been appointed Assistant General Passenger Agent of the L. V.

Long Island (Pennsylvania).—The directors have elected R. W. Downing Comptroller; M. Reibenack, Assistant Comptroller, and Robert W. Smith, Treasurer. These men held similar positions with the Pennsylvania.

Pennsylvania.—The following appointments have been made on the Buffalo & Allegheny Valley Division, all to take effect August 1: R. N. Durborow, Superintendent of Motive Power, and H. P. Lincoln, Principal Assistant Engineer, both with offices at Buffalo, N. Y.; J. C. Glass, Master Mechanic at the Verona shops. On the River Division the Supervisor's Division No. 1 will comprise that portion between Pittsburgh and the south end of Verona yard. F. A. Hayes is appointed Supervisor, with headquarters at Forty-third street, Pittsburgh. The Second Division will extend from the south of Verona yard to Redbank, including the Plum Creek Branch. J. G. Ehrenfeld, Supervisor, with headquarters at Verona. District No. 3 extends from Redbank to Oil City. H. E. Bradley, Supervisor, with headquarters at Emlenton. F. M. Ashmead has been appointed Engineer Right of Way, and Assistant Engineer on the River Division. A. C. Shand, Assistant to the Principal Assistant Engineer at Altoona, Pa., has been promoted to Principal Assistant Engineer, succeeding M. W. Thomson, transferred. E. J. Cleave, Assistant Engineer of the Eastern and Susquehanna divisions of the Philadelphia & Erie and the Northern Central, succeeds Mr. Shand, and is succeeded in turn by Gerald Holsman, Supervisor of the New York Division. Mr. Holsman is succeeded by J. W. Stone, Supervisor of the Schuylkill Division, and Mr. Stone by R. V. Massey, Assistant Supervisor of the Middle Division. John L. Mohun has been appointed Assistant Engineer Motive Power on the United R. R. of New Jersey Division, succeeding James Milliken, promoted. Mr. Mohun is succeeded by W. B. Page as Master Mechanic at the Lambertville, Pa., shops. Both appointments take effect August 1.

Pere Marquette.—The appointment of George F. Weidman as Superintendent of Telegraph, noted last week, is in addition to his other duties as Secretary to the President.

Plant System.—Wilbur McCoy has been appointed Freight Claim Agent, to succeed J. C. Bruyn, resigned.

Seaboard Air Line.—The jurisdiction of John T. Patrick, Chief Industrial Agent, and of Mrs. Eugene B. Heard, General Superintendent of Free Traveling Libraries, has been extended over the entire system.

Western New York & Pennsylvania (Pennsylvania.)—Robert W. Smith, Treasurer of the Pennsylvania, was elected Treasurer of this company at a meeting of the directors held in Philadelphia July 24.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

AKRON, STERLING & NORTHERN.—This company's articles of incorporation have been amended so as to permit the building of a line from the head of Aldez Bay in Alaska through Dutch Valley to Thompson Pass. This company was incorporated in Colorado, Feb. 14, by officers of the Burlington & Missouri River in Nebraska to build from Akron, Colo., north through Sterling, both on the Chicago, Burlington & Quincy line. (Construction Supplement, July 27, 1900.)

ALTON & HUTTONSVILLE.—This company has been incorporated in West Virginia, with a capital stock of $500,000, to build a railroad from Beaus Mills, Upshur County, southeast to Huttonsville, Randolph County, on the West Virginia Central & Pittsburgh. The incorporators are: A. T. Giffin, E. G. Wilson, G. S. Lordin, John D. Coffin and C. C. Higginbotham, all of Buckhannon, Upshur County.

ATCHISON, TOPEKA & SANTA FE.—An officer confirms the statement that the control of the Gulf, Beaumont & Kansas City has passed into the Atchison. The company intends to extend its Somerville-Conroes branch east through Texas to a junction with the Gulf, Beaumont & Kansas City at a point not yet determined. The proposed extension and the new line will give the Atchison nearly 200 miles of track through one of the finest timber belts now remaining in the State. The Atchison, for the most part, traverses prairie region which has no timber, and it has been the intention for some years to tap the long leaf pine territory to supply the wants of consumers in Oklahoma and Kansas. (July 20, p. 502.)

BALTIMORE & OHIO.—Extensive additions are reported being made to the yards at Morgantown, W. Va., and Smithfield, Pa., on account of the new lines now building known as the Morgantown & Kingwood and the Smithfield & Masontowu.

BOSTON & MAINE.—The County Commissioners at Salem, Mass., on July 26, gave a hearing to the petition by this company to take over additional land for terminal purposes at Marblehead.

CANADIAN PACIFIC.—Surveys are reported in progress for a cut-off from Golden, B. C., to Sand Creek.

Surveys are reported in progress for an extension of the Lardo branch in British Columbia northeast over the Divide and down Toby Creek into the mining region of the Windemere District.

J. D. McArthur is building the extension of the branch to Hartney, Man., about five miles, and expects to have the line completed in about a month.

J. W. Stewart has the contract for building the line connecting the Crows Nest Pass line with the Nelson & Fort Sheppard, and building is to be begun at once.

CENTRAL NEW ENGLAND.—The Connecticut Board of Railroad Commissioners, on July 23, approved the layout for the connecting link of 313 ft. of the Tariffville branch across the Montague farm in the town of East Granville. It is understood that application will be made to the court to appraise and condemn the land. (April 26, p. 279.)

CENTRAL OF GEORGIA.—Surveys are reported in progress for a line from Arlington, Ga., northeast about 30 miles via Morgan to Dawson, another point on the same line. One proposed survey is from Morgan via Doverly and the other via Herod.

CENTRAL ONTARIO.—Building is reported begun and about 1½ miles graded beyond Bancroft, Ont., on the extension from Bancroft northwest to a point on the Canada Atlantic. (May 4, p. 259.)

CENTRAL VERMONT.—The Dominion Parliament has passed a bill granting a subsidy to the Montreal & Providence line for an extension from Farnham, Que., southeast 18 miles to Frelighsburg.

CHICAGO & NORTHWESTERN.—Plans have been submitted to the Government officers at St. Paul, Minn., by the Chicago, St. Paul, Minneapolis & Omaha, for a line from Minneapolis into Fort Snelling.

CHICAGO, MILWAUKEE & ST. PAUL.—Arrangements are reported being made to cut down the grade on the Libertyville, Ill., branch preparatory to making it a through line to Janesville, Wis., on the completion of the road now building.

DELAWARE, LACKAWANNA & WESTERN.—Allen & Russell have begun work on the cut-off connecting the main line east of Waterloo, N. J., with the Sussex Division. When completed it is understood that through trains are to be run from Newton into Jersey City. (April 6, p. 227.)

DENVER & RIO GRANDE.—Among the proposed lines of the Rio Grande, a subordinate company, whose incorporation was noted in the Construction Supplement last week, are the following: From Texas Creek Station, in Fremont County, Colo., southeast about 70 miles to a connection with the Loma branch in Huerfano County. Of this 27 miles is to be built soon and bids are to be asked at once. This extension is to have a branch northwest to connect with Moffat Station. Another branch is proposed from Delta, Colo., east toward the Crested Butte branch. Another line is projected as an extension of the Creede branch west up the valley of the Rio Grande del Norte and thence towards Durango. Another line is projected from Durango southwest to Farmington, N. M., and thence west across the Rio San Juan into Utah.

DETROIT & LIMA NORTHERN.—Authority has been granted to the receivers to issue $74,000 of certificates to complete the eight miles of line between Lima, Ohio, and the South Adrian Junction.

ERIE.—The company filed, last week, maps showing the double track Goshen cut-off of 2¾ miles west of Goshen, N. Y. The incorporation for the building was made about two years ago. (Construction Supplement, July 27, 1900.)

EUREKA & KLAMATH RIVER.—An extension is proposed from Buckman, Cal., north about six miles to Little River.

GREAT EASTERN.—Grading is begun at Fremont, N. C., on this proposed line from Selma east 137 miles via Fremont and Snow Hill to Douglas Bay on Pamlico Sound. J. W. Lynch, of Kingston, N. C., is President. (July 20, p. 502.)

GULF & INTERSTATE.—Extensive improvements are to be made on this line, according to report, including new ties and new ballasting.

GULF & SHIP ISLAND.—Contracts will be let, according to report, within 60 days for a number of branches

aggregating about 100 miles through the pine woods of Southern Mississippi.

HILLSBORO & EASTERN.—Surveys are reported begun for this line from a point on the Chicago & Northwestern between Elroy and Wonewoc, Wis., to run west about six miles to Hillsboro. Wm. J. Abbey, of Hillsboro, Wis., is Secretary; Robert H. Smith, Elroy, Wis., General Manager and Treasurer. The contract has been let to Smith H. Bracey, Chicago, and the road is to be finished by Jan. 1, 1901. (Construction Supplement, July 27, 1900.)

ILLINOIS CENTRAL.—Improvements are to be undertaken, according to report, at Jackson, Miss., which are made necessary by the entrance of the new line of the Gulf & Ship Island.

LAKE REGION, MANATEE RIVER & GULF.—Work is to be begun soon, according to report, on this line, which is practically an extension of the Tavares & Gulf, to run from Cleremont, Fla., southwest about 110 miles to Bradentown. W. B. Tucker, Orlando, Fla., General Manager of the Tavares & Gulf, is Vice-President and General Manager. (July 21, 1899, p. 531.)

LITTLE FALLS & DOLGEVILLE.—Surveys are reported completed for an extension to the Salisbury iron mine near Little Falls, N. Y.

LOUISVILLE & NASHVILLE.—C. D. Hutton & Co., of Mobile, have the contract for the extension from Hanceville, Ala., to the mineral lands of the Stout Mountain Coal Co. It is to be completed within four months. (March 9, p. 161.)

MANISTEE & NORTHEASTERN.—A branch is proposed from Fouch to Northport, Mich., 22 miles.

MARINETTE, TOMAHAWK & WESTERN.—Fuller & Huss, of Chicago, have the contracts for the first 15 miles toward Antigo and Marinette, and building is reported under way. (Construction Supplement, July 27, 1900.)

MEXICAN NATIONAL.—A Monterey, Mex., despatch states that building is to be begun soon on the connecting line from San Miguel west 180 miles to Monterey, giving the company a direct line to Matamoras and Brownsville, Tex. This project has been under consideration for a number of years.

MEXICAN ROADS.—A new road has been built, according to report, from Selva Station, on the Sonora, to the Copte mine of the Neiczer Mining Co., and the Sultana mine of J. L. Giroux, 10 miles.

MICHIGAN & OHIO ELECTRICAL.—This company was incorporated in Michigan July 23, with a capital stock of $200,000, to build a third-rail electric railroad from Detroit south to Toledo, Ohio. Among the incorporators are Judge Donovan, W. W. Johnston and Milton Carmichael, Detroit.

MISCELLANEOUS COMPANIES.—The Herkimer Construction & Improvement Co., of New York City, has been incorporated in New York with a capital stock of $10,000, to build and equip railroads, telegraph and public works. The directors are: Robert Earl, Herkimer; Louis W. Stolcsbury and Thomas E. O'Shea, of New York City.

MONTANA ROADS.—The Butte Mercantile Co. of Butte writes that the right of way granted through that city is simply for a siding from the Butte, Anaconda & Pacific tracks to the company's new track. (July 13, p. 488.)

NASHVILLE & KNOXVILLE.—Surveys are completed for the extension from Monterey, Tenn., northeast about 17 miles to the Laurel Creek coal fields. The company is ready to let contracts. (April 27, p. 280.)

OREGON SHORT LINE.—Extensive improvements are reported in progress. The line is to be newly ballasted, embankments widened, grades reduced and curves eliminated, on about 160 miles this year. Preliminary surveys are being made for a proposed change through Lima, Mont., necessitating the building of from six to eight miles of new line.

PARAGON.—Building is reported begun on this line from Langley, S. C., on the Southern, to the Paragon kaolin mines, three miles, and one mile is completed. Thomas J. Davies, of Beech Island, S. C., is President. (June 15, p. 408.)

PENNSYLVANIA.—Extensive improvements, according to report, will soon be made in the city of Pittsburgh, Pa., which involve the change of the line from South Eleventh street to Beck's Run.

PENNSYLVANIA COMPANY.—The Cleveland & Pittsburgh is reported preparing to make extensive improvements in the lower end of Steubenville, O., including the filling in of land for the enlargement of yards.

PITTSBURGH, CONNELLSVILLE & WHEELING.—Contracts are let for four sections of the West Virginia portion of this line from Connellsville, Pa., west about 50 miles to Wheeling as follows: Ransaeller, Miller Construction Co., Lock Haven, Pa.; A. M. Jolly, Pittsburgh, Pa.; C. A. Simms & Co., Philadelphia; E. A. Post, Wilkesbarre, Pa. The sections 5, 6 and 7 from Moundsville to Shepherds will be let about August 10. Edgar A. Holmes, of Wheeling, W. Va., is General Manager. (July 13, p. 488.)

PLYMOUTH COUNTY.—Building will be begun soon, according to report, on a branch from Hanover, Mass., east about six miles to Brant Rock. E. Worthington, of Dedham, Mass., is Chief Engineer.

POINT RICHMOND TERMINAL.—This company was incorporated in California July 24, with a capital stock of $800,000, to build terminals at Point Richmond across from San Francisco. The incorporators are: Lyle M. Fletcher, Robert Capelle, N. C. Wells, Spencer Bishop, Rossell G. O'Brien, Hiram H. Lee, Howard C. Holmes.

PORT DOVER, BRANTFORD, BERLIN & GODERICH.—The town of Waterloo, Ont., has granted a bonus of $9,000 to this line, which proposes to build from Goderich, Ont., southeast about 150 miles via Leadbury, Milverton, Heidelburg, Berlin, Galt and Preston to Port Dover, on Lake Erie. This company was formerly known as the Grand Valley. W. J. Clark, of Toronto, Ont., is solicitor. (Grand Valley, Construction Supplement, July 27, 1900.)

PORT HURON SOUTHERN.—Track laying is reported begun on this new line from Port Huron, Mich., south six miles to a point on the St. Clair River. J. W. Cooper, of St. Paul, Minn., is President; R. M. Woods, Port Huron, Mich., General Manager and Chief Engineer. (March 2, p. 146.)

ST. LOUIS, IOWA & DAKOTA.—Surveys are completed on this line from Sioux City, Ia., south to St. Louis, Mo. The distance by the latest survey is 480 miles. T. P. Gere, Sioux City, Ia., is President; L. F. Wakefield is Chief Engineer. (Construction Supplement, July 27, 1900.)

SAN ANTONIO, LLANO & NORTHERN.—Right of way is being secured, according to report, and building will be begun soon on this proposed line from Strawn, Tex., south about 140 miles to Llano. George W. Angle, of Austin, Tex., is General Manager. (July 22, 1898, p. 539.)

SHADY VALLEY.—This company was incorporated in Tennessee, July 23, to build a railroad from Damascus, Va., to the lower end of Shady Valley in Johnson County, Tenn., about 12 miles. The incorporators are: E. E. Butler, Richard E. Downey, E. E. Parry, W. T. Smythe, H. A. Downey and J. E. Butler. This is probably the same company as the one incorporated last year in Virginia, of which J. W. Lockhart, of Bluff City, Tenn., is Chief Engineer. (Construction Supplement, July 27, 1900.)

SOUTHERN.—The company is reported about to let a contract for improvement of its Mobile (Ala.) terminals at a cost of $100,000.

SOUTHERN PACIFIC.—An officer writes, with reference to the improvements under consideration between Wadsworth and Ogden, Utah, as follows: A cut-off will be built between Lucin and Ogden to avoid the grades over Promotory Hill and shorten the line from 40 to 42 miles. The grades over the Pequop Mts. between Wells and Lucin are to be reduced to 1 per cent. The line between Wells and Wadsworth is to be straightened in places and the grades taken out so that between those points the rolling grade will be 4 per cent. Similar improvements will be made between Wadsworth and Reno. These changes will make of the Central Pacific, west of the Sierra Nevada Mts., a low-grade line, permitting the hauling of much heavier train loads and resulting in correspondingly cheaper operation. (Construction Supplement, July 27, 1900.)

With reference to the reported surveys from Kelton, Utah, northwest into the Silver Lake country in Idaho, an officer writes that they are not being made by the Southern Pacific. (July 13, p. 488.)

SPARTANBURG & CLINTON.—No surveys have been made as yet for this line from Clinton, S. C., on the Seaboard Air Line north about 40 miles to Spartanburg. There will be two bridges required of 200 ft. each. The company intends to ask bids soon for 40 miles of 60-lb. rails. The company has no official connection with the Seaboard Air Line. John Gary Evans, of Spartanburg, S. C., is interested. (July 20, p. 502.)

SUNSET.—Bonds for $500,000 have been voted for this proposed line from Bakersfield, Cal., on the Southern Pacific, southwest 39 miles via Gosford and Lakeside to Sunset. C. M. Beal, of Bakersfield, is President, and J. L. Browne, Chief Engineer. (May 11, p. 312.)

TAMIGAMI.—The Dominion Senate, in passing the bill to incorporate this line, has amended the route so that it runs from Domremry (Des Mairais), Que., about two miles west of Verner Station on the C. P. R., thence along the line between the townships of Kirkpatrick and Caldwell, Hugel and Badgerow, Crearer and Gibbons, Dana and McWilliams, and Pardo and Hobbs to a point on the south end of the southwest bay of Lake Tamigami, called Bay Jeanne. (Construction Supplement, July 27, 1900.)

TEXAS & CORSICANA.—This company was incorporated in Texas July 24, with a capital stock of $200,000, to build a railroad in Angelina County from Lufkin to Windham, 14 miles. The central office is at Lufkin. Among the incorporators are: E. W. Frost, T. L. L. Temple, C. M. McWilliams, of Texarkana; C. T. Crowell, of Los Angeles, Cal.; C. D. Johnson, of St. Louis, and others.

TEXAS & LOUISIANA.—Application has been made in Texas to incorporate this company to build a railroad from Lufkin to Huntington, on the Texas & New Orleans line of the Southern Pacific, 12 miles.

TIFTON, THOMASVILLE & GULF.—Application has been made to the Georgia Secretary of State to amend the company's charter, increasing the capital stock from $100,000 to $1,000,000, for extending the line from Thomasville, Ga., south 36 miles to Tallahassee, Fla. (Construction Supplement, July 27, 1900.)

UNION PACIFIC.—A branch will be built this summer, according to report, from Walcott, or Fort Steele, Wyo., south to Grand Encampment and Battle Lake.

GENERAL RAILROAD NEWS.

ATLANTIC & LAKE SUPERIOR.—The sale of the Baie des Chaleurs line, advertised on July 19, did not take place. It is understood that Mr. Joaquin Salinday, of London, England, has taken the line over in behalf of the bondholders, and will complete building to Paspebiac, Que. (June 15, p. 408.)

BOSTON & MAINE.—A special meeting of the stockholders has been called for August 23, to ratify the purchase of the preferred stock of the Central Massachusetts at $65 per share. (C. M., July 20, p. 502.)

CANADIAN NORTHERN.—This company, whose line is being built by Mackenzie & Mann, Toronto, from Lake Superior west across Manitoba to the Pacific coast, is offering £700,000 of 4 per cent. first mortgage debenture bonds at 90. Subscriptions may be received at the Canadian Bank of Commerce at Montreal and branches, and at the Bank of Scotland, Edinburg, London and branches. (Construction Supplement, July 27, 1900.)

CENTRAL PACIFIC.—The 3 per cent. bonds outstanding have been reduced from $21,090,000 to $20,486,000. (April 20, p. 264.)

CHICAGO, BURLINGTON & QUINCY.—The gross earnings for the fiscal year ended June 30, 1900, were $47,535,420, against $43,389,425 last year, making an increase of $4,145,995. The net earnings, after deducting operating expenses and fixed charges, were $7,638,582 this year, against $6,728,300 last year, a gain of $910,282. (July 27, p. 518.) Trackage rights are reported obtained from Sterling, Colo., southwest about 24 miles to Balzac, to form part of the line now building from Bridgeport, Neb., southwest to Brush for the cut-off into Denver. (See Construction Supplement, July 27, 1900.)

DELAWARE, LACKAWANNA & WESTERN.—Redmond, Kerr & Co., and Joseph Walker & Sons, have bought $2,000,000 of Warren R. R. first mortgage refunding bonds. The proceeds will be used to retire $750,000 7 per cent. bonds maturing Oct. 15, 1900; to provide for the refunding and retiring in 1905 of the $600,000 consols; to reimburse the D., L. & W. for advances of about $50,000 made to the Warren R. R., and for extensions and improvements. The new bonds are 100-year gold 3½ per cents dated Aug. 1. (March 16, p. 178.)

DETROIT & LIMA NORTHERN.—Judge Thompson, in the U. S. Court at Cincinnati, O., on July 20, discharged the receiver of the Columbus Northwestern, and the line will be operated by the receivers of the main line. The Columbus Northwestern is to be sold on Aug. 31 by Irvin Bedford, Master in Chancery, at Bellefontaine, Ohio. The upset price is $200,000. (See also under Railroad Construction. (July 20, p. 502.)

FONDA, JOHNSTOWN & GLOVERSVILLE.—Rhodes & Richmond, of New York City, offer for sale $200,000 of the new 50-year gold bonds, due July, 1950.

GULF, BEAUMONT & KANSAS CITY.—See Atchison, Topeka & Santa Fe, under Railroad Construction.

INDIANA, ILLINOIS & IOWA.—At a special meeting of the stockholders, held in Chicago, July 24, it was voted to issue $12,000,000 of 50-year 5 per cent. bonds. (July 20, p. 502.)

KANSAS MIDLAND.—This property was sold at public auction, July 25, for $500,000, to Alfred R. Peck and Harry Brouner, representing the bondholders. The road is to be acquired by the St. Louis & San Francisco. (May 18, p. 330.)

LONG ISLAND.—The company has canceled the $1,500,000 7 per cent. mortgage which matured May 1, 1898. (May 18, p. 330.)

MICHOACAN & PACIFIC.—With reference to the report that this line has been acquired by the Mexican National, an officer writes that negotiations have been carried on between the two companies for the past two years, but as yet nothing has been definitely decided.

NORTHERN CENTRAL.—Of the new stock recently authorized, the increase to $12,000,000, $2,503,983 was subscribed to by stockholders at $70 for each $50 share. The company has also issued $1,439,350 additional stock to buy securities of other companies and for corporate purposes. The amount outstanding is $11,461,483.

PITTSBURGH & WESTERN.—The committee of which A. Foster Higgins is Chairman, notifies preferred stockholders that the committee has negotiated a contract for the sale of the stock. The contract provides that the purchaser shall take at the same price all other stock which the committee may offer. Deposits may be received under the agreement of March 7, 1899, until noon, Aug. 7, at the Knickerbocker Trust Co., New York. It is stated that control of the road has been obtained by the Baltimore & Ohio. (March 2, p. 146.)

PITTSBURGH, PAINESVILLE & FAIRPORT.—Default occurred, July 1, on the first mortgage 5's of 1886, and the terminal bonds of 1889. More than 90 per cent. of the 5's have been deposited with the Mercantile Trust Co. under the agreement of last year. (July 28, 1899, p. 548.)

QUEBEC & LAKE ST. JOHN.—Under the reorganization plan provided for in the recent act of the Legislature of the Province of Quebec, there are to be issued £170,000 of sterling prior lien 4 per cent. bonds and £400,000 of new mortgage bonds which are to bear the interest rate of 3 per cent. for the first three years, 4 per cent. for the next two years and 5 per cent. thereafter until maturity; also a certain amount of 6 per cent. noncumulative income bonds, interest payable out of the net profits after the payment of interest on the sterling prior lien and first mortgage issues. Each holder of £100 of existing first mortgage bonds will receive in exchange £50 in the new mortgage bonds and £50 in the new 6 per cent. incomes. In compensation for interest changes and for default, each holder of £100 of existing first mortgage bonds will receive an additional £10 of the 6 per cent. non-cumulative bonds. The prior lien bonds are to be sold at 95 to provide means for improvements during the next few years, and to take up certain privileged debts. (March 19, p. 162.)

SHELBYVILLE & BLOOMFIELD.—This road was placed in the hands of E. B. Beard, as receiver, on July 16. Efforts for the independent operation of the property have as yet not succeeded. (June 29, p. 458.)

SOUTHERN.—Drexel & Co., of Philadelphia, have obtained subscriptions to $3,000,000 series A 4 per cent. equipment trust bonds, dated May 1, 1900, and payable in semi-annual installments on April 30 and Oct. 31, until Oct. 31, 1907. The trust covers 18 passenger engines, 1,950 double-hopper coal cars, 500 flat cars, 200 coking cars and 800 ventilated box cars (July 13, p. 488.)

TERRE HAUTE & LOGANSPORT.—Judge Woods, of the U. S. Court, at Indianapolis, is reported to have ordered the Receiver, Volney T. Mallott, to pay $5,222.55 to Benjamin Harrison, trustee, for distribution among the bondholders of the old extension $1,000,000 mortgage foreclosed. Payment will be made in New York by the New York Security & Trust Co., and in Philadelphia by Drexel & Co. (Jan. 20, 1899, p. 55.)

TEXAS & NEW ORLEANS.—The stockholders, on July 17, authorized the issue of 4 per cent. first mortgage bonds on the new line from Rockland, Tex., to Dallas, with branches, and on the line from Orange, Tex., to the Sabine River. (May 25, p. 348.)

TOLEDO, ST. LOUIS & KANSAS CITY.—Judge Thompson, in the U. S. Circuit Court at Toledo, on July 27, issued an order to discharge Receiver Hunt and turn over the property to the new Toledo, St. Louis & Western. The order was made effective Aug. 1. (July 6, p. 472.)

UNION PACIFIC.—The gross earnings for the fiscal year ended June 30, 1900, were $23,046,907, against $20,516,038 for the preceding year, a gain of $2,530,869. The surplus, after taking out expenses and taxes for the fiscal year 1900, was $9,724,685, against $8,574,015 last year, a gain of $1,150,670. The average mileage operated this year was 2,926.99, against 2,782.26 last year. At the meeting of the Board of Directors held in New York July 31, it was voted to increase the semi-annual dividend from 1½ per cent. to 2 per cent., putting the annual dividends on a 4 per cent. basis. (July 27, p. 518.)

VELASCO TERMINAL.—The District Court at Angleton, Tex., has ordered the Receiver to sell this road at a date to be fixed by the Commissioner, R. G. Duff, appointed by the Court. The upset price is $50,000. The road went into the hands of the receiver on July 26, 1899. (August 11, 1899, p. 576.)

WHEELING & LAKE ERIE.—Deposits have been made, up to July 21, under the refunding plan as follows: Lake Erie Division first mortgage, $1,000,000 out of $3,000,000; Wheeling Division first mortgage, $559,000 out of $1,500,000; extension and improvement mortgage, $1,272,000 out of $1,624,000; Toledo Belt first mortgage, $8,000 out of $276,000. (May 25, p. 348.)